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**Final
Environmental Impact Statement for the
Atlantic Rim Natural Gas Field
Development Project
Carbon County, Wyoming**

Volume 2 of 2

BLM



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MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

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APPENDIX A

INTERIM DRILLING POLICY

DEVELOPMENT AUTHORIZED CONCURRENT WITH EIS PREPARATION FOR THE ATLANTIC RIM COAL BED METHANE PROJECT

During the preparation of the Atlantic Rim Coal Bed Methane Environmental Impact Statement (EIS), the Bureau of Land Management's (BLM) authority to allow drilling on the federal mineral estate is limited. The Council on Environmental Quality (CEQ) Regulations and 40 CFR 1506.1, *limitations on actions during NEPA process* to comply with the National Environmental Policy Act (NEPA) provide the following regarding limitation on concurrent authorizations:

Section 1506.1

- (a) *Until an agency issues a record of decision as provided in para. 1505.2 (except as provided in paragraph (c) of this section), no action concerning the proposal shall be taken which would:*
 - (1) *Have an adverse environmental impact; or*
 - (2) *Limit the choice of reasonable alternatives.*
- (b) *If any agency is considering an application from a non-federal entity, and is aware that the applicant is about to take an action within the agency's jurisdiction that would meet either of the criteria in paragraph (a) of this section, then the agency shall promptly notify the applicant that the agency will take appropriate action to insure that the objectives and procedures of NEPA are achieved.*
- (c) *While work on a required program environmental impact statement is in progress and the action is not covered by an existing program statement, agencies shall not undertake in the interim any major federal action covered by the program which may significantly affect the quality of the human environment unless such action:*
 - (1) *Is justified independently of the program;*
 - (2) *Is itself accompanied by an adequate environmental impact statement; and*
 - (3) *Will not prejudice the ultimate decision on the program. Interim action prejudices the ultimate decision on the program when it tends to determine subsequent development or limit alternatives.*
- (d) *This section does not preclude development by applicants of plans or designs or performance of other work necessary to support an application for federal, state or local permits or assistance....*

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The above regulations and the following criteria and conditions will be used by the BLM to determine new exploratory activities allowed on federal surface and/or minerals during preparation of the EIS. They also establish conditions under which these activities will be approved. The intent of these criteria and conditions are to keep all activity within the scope of existing analysis and at a reasonable level, to allow limited drilling activity for acquisition of additional data necessary for completion of the EIS, and to prevent unnecessary hardship to leaseholders. These criteria may be modified by the BLM authorized officer (AO) if any of the allowed activities are viewed as having a potentially significant effect on the environment or prejudice the ultimate decision on the drilling program for the EIS as outlined in the CEQ regulations quoted above.

ACTIVITIES ALLOWED ON FEDERAL LANDS AND MINERALS DURING EIS PREPARATION

1. A maximum of 200 coal bed methane wells will be allowed within the project area, for research and exploratory purposes, during the interim period in which the EIS is prepared. Wells will only be allowed in the nine pods the operators have proposed and a maximum of only 24 coal bed methane wells will be allowed within any pod, regardless of multiple zones to be evaluated (see map).
2. Activities within individual pods will be authorized by BLM. For any pod location which overlaps the boundary of a sensitive resource area for sage-grouse, mountain plover, raptors, big game migration corridors, and sensitive plants, appropriate stipulations and mitigation will be applied to protect any sensitive resources present (see Term Definitions below). Some sensitive resources such as high density paleontological or cultural resources sites, are not mapped and will also be handled on a pod basis.
3. Existing coal bed methane wells (two wells re-completed as coal bed methane producers in the Cow Creek Unit by Double Eagle and one new well completed by Petroleum Development Corporation (PEDCO), to the east of this unit) will count toward the above well limits. As Federal 1691 #10-8 has been plugged and abandoned, it will not count toward the above well limit. In addition, the six coal bed methane wells originally permitted by North Finn LLC and drilled in Section 5, T. 17 N., R. 90 W., and the well located in Section 36 of T. 15 N., R. 91 W., will not count toward the allowed well number, as long as they are not included as part of any proposed pod. In addition, required injection wells and monitoring wells will not count toward the well limit.
4. Any modifications proposed to the approved pods (i.e. changing pod locations, drilling wells outside of the current pod locations, or increasing the total number of wells allowed during interim drilling), will only be approved if geologic, hydrologic, or reservoir characteristics support a change. These changes will be allowed after review by, and concurrence of, the Reservoir Management Group (RMG) and authorization by the BLM, Rawlins Field Office (RFO). Additional federal drainage protection wells may be required.
5. During preparation of the EIS, coal bed methane wells and associated roads and pipelines on any private surface/private mineral where the operator has, or has obtained legal access (i.e., county roads, approved BLM Right-of-Way (ROW) grant

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or private access road) prior to approval of the interim drilling plan, may be developed as deemed appropriate by the operator/lessee. However, these wells will count toward the total number of wells allowed to be drilled under this interim drilling policy.

THE FOLLOWING CRITERIA AND CONDITIONS APPLY TO INTERIM DRILLING OPERATIONS

1. A detailed Plan of Development/Surface Use Plan (POD/SUP) and Master Drilling Plan for each individual pod, using guidance provided by the BLM RFO, will be submitted and approved prior to surface disturbing activities.
2. The operator(s) agree to supply the geologic, coal, and water data information discussed in attachment 1 of this document.
3. Prior to initiating interim drilling, an environmental assessment (EA), including a detailed Water Management Plan will be prepared and approved for each individual pod. Because of the current BLM workload, and in order to expedite the completion of the EAs, it is recommended that these documents be prepared by a third-party contractor.
4. All pod EA's will be submitted to the BLM in PDF format and each document will be placed on the BLM Wyoming web page. A 30-day public review of each document will occur from the date the document is placed on the site. BLM will be responsible for writing the decision record for each EA.
5. A 1/4 mile buffer is required between surface disturbing activities and the Overland Trail.
6. Block surveys for cultural resources will be required for each pod.
7. No interim drilling will be allowed in the Sand Hills Area of Critical Environmental Concern as described in the Great Divide Resource Management Plan Record of Decision (USDI-BLM 1990).
8. The Great Divide RMP states the BLM will include intensive land-use practices to mitigate salt and sediment loading caused by surface disturbing activities within the Muddy Creek watershed. The Muddy Creek Coordinated Resource Management (CRM) group was established as an advisory group to address this issue. Because this area overlaps with the Muddy Creek CRM effort, and since road use contributes the most in increasing the amount of sediment in the Muddy Creek drainage, the POD/SUP will be reviewed by the Muddy Creek CRM Road Committee and recommendations of the group will be considered by BLM. Changes to the POD/SUP will be made prior to initiating work on the pod EA.
9. Surface discharge as a method of disposal for produced coal bed methane waters will be considered for each individual pod during interim drilling activities within the Great Divide Basin. This is subject to the approval of the Water Management Plan and upon obtaining all required federal, state and local permits.

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10. Prior to completion of the EIS, water produced from coal bed methane wells located in the Colorado River Basin will be disposed of by re-injection. The only exception to this would be waters produced from the Double Eagle's coal bed methane existing and proposed wells located in the Cow Creek Pod (Pod #6). Double Eagle has applied to the Wyoming Department of Environmental Quality (WDEQ) for a National Pollutant Discharge Elimination System (NPDES) permit for their two existing wells and four wells permitted recently by BLM. Should Double Eagle receive their state permit, they will be allowed to surface discharge from these six wells. Prior to any additional drilling of CBM wells by Double Eagle in Pod #6, an environmental assessment, including a Water Management Plan, will be prepared and submitted to BLM which will examine the environmental impacts from these wells. Double Eagle will be allowed to dispose of produced CBM waters to the surface only after completion of the environmental analysis and a determination is made that the additional surface discharge will cause no significant impact to the environment.
11. No drilling activities will be allowed in prairie dog towns during interim operations. However, drilling will be allowed in each individual pod containing prairie dog towns upon the completion of black-footed ferrets survey using methods approved by the United States Fish and Wildlife Service. These surveys will clear the pod for a one year period. The operators also have the option of completing surveys in the whole EIS area which would clear the area for the life of the project.
12. In the event a black-footed ferret or its sign is found, the BLM Authorized Officer shall stop all action on the application in hand, and/or action on any application that may directly, indirectly, or cumulatively affect the colony/complex, and initiate Section 7 review with the United States Fish & Wildlife Service (USFWS). No project related activities will be allowed to proceed until the USFWS issues their biological opinion. The USFWS biological opinion will specify when and under what conditions and/or prudent measures the action could proceed or whether the action will be allowed to proceed at all.
13. No drilling or disturbance will be allowed in those areas determined to be critical winter habitat for sage-grouse.
14. No drilling or disturbance will be allowed in areas where any two or more big game (elk, deer, or antelope) crucial winter ranges overlap.
15. The operators will be required to submit a drilling schedule as part of the Master Drilling Plan. This schedule will be reviewed, and approved by BLM, to ensure that activities are limited within proven big game migration corridors at critical use times during the year.
16. Pipelines, power lines, waterlines, fiber optic lines will be buried and, where possible, will follow the road rights-of-way.
17. Fish passage structures will be installed for roads which cross drainages with fisheries concerns as identified by BLM.

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TERM DEFINITIONS

SENSITIVE RESOURCE AREAS are defined as those areas containing stabilized sand dunes, sensitive plant areas, raptor nesting concentration areas, prairie dog towns, two-mile buffer around sage-grouse leks, mountain plover aggregation areas or potential habitat, big game migration corridors and crucial big game winter ranges, and areas with high density cultural or paleontological resource sites. Field inspections by the BLM will be conducted to verify presence of these resource values and potential impacts prior to considering authorization of any proposed development activity on federal surface and/or minerals.

WILL BE AUTHORIZED means BLM will authorize the action if, following the environmental review of the Application for Permit to Drill (APD) or ROW application, sensitive resource areas are protected with appropriate stipulations or mitigation and the criteria established under CEQ regulation 40 CFR 1506.1 have been met. An EA will be completed for each individual pod prior to authorizing the proposal. Consultation and Coordination with the Wyoming Game and Fish Department and the U.S. Fish and Wildlife Service will occur when applicable for proposed activity within sensitive resource areas. The pod EA will identify the most environmentally acceptable access route, well site, and pipeline location. Mitigation measures developed from nearby project EISs and EAs for protection of resource values may be considered in the assessment. Any action proposed must be in conformance with the Great Divide Resource Management Plan (RMP) and mineral lease terms and conditions.

A coal bed methane pod may consist of two or more production wells, injection wells, access roads, product pipelines, water pipelines, power lines and other ancillary facilities designed specifically to assess the development potential of the play.

REFERENCES CITED

USDI-BLM 1990. *Great Divide Resource Area Record of Decision and Approved Resource Management Plan*. Rawlins, Wyoming: U.S. Department of the Interior, Bureau of Land Management, Rawlins District Office, Great Divide Resource Area. 74 pp.

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ATTACHMENT A-1

DATA SUBMISSION REQUIREMENTS

A. GEOLOGIC AND COAL INFORMATION REQUIRED TO BE SUBMITTED BY OPERATORS DURING INTERIM DRILLING ACTIVITIES

The geologic and coal information needs identified below are those that the RMG, in consultation with the United States Geologic Survey, has determined are needed based on their experience with coal bed methane development in the Powder River Basin. The information will be used to define the potential gas resource and provide valuable data for the NEPA assessment including the determination of future development potential.

1. Operators will provide copies of all geologic information obtained to the RFO and the RMG as required under 43 CFR 3162.4.
2. The suite of logs required to evaluate coalbeds in the project area are high resolution gamma ray, resistivity, density, and neutron logs. The full suite will be required during this phase but may be reviewed for changes during any later drilling phase.
3. Detailed geologic and coal information will be required and obtained for a minimum of one well within each of the nine pods. Information required includes; coal cores, fluid level, and production analysis. From this data information can be obtained on coal rank, adsorption and desorption gas content, core density, specific gravity, orientation of cleats and joints, initial saturations, coal permeability, and desorption pressure.
4. Initial reservoir pressure for each pod drilled.
5. Agree to standard stratigraphic nomenclature for all operators to use in preparing reports to the BLM and Wyoming Oil and Gas Conservation Commission.
6. Obtain an initial reservoir pressure for each coal bed in three of the pods.
7. Obtain reservoir pressure at the end of one year and two years, for each coal bed in three of the pods.

B. WATER ASSESSMENT/MONITORING DATA NEEDS

Recognizing that surface and ground water resources can be affected by large coal bed methane drilling projects, the following data submission requirements will be necessary to complete the assessment of impacts and develop baseline water conditions. Also water monitoring data has been found to be vital when reviewing drainage situations.

1. The operator(s) will obtain aquifer hydraulic baseline data for all pods in the initial exploration phase. This will include hydraulic conductivity and storativity derived from a multiple well pumping test conducted at each pod. This information could be used to provide data for the NEPA document and to assess monitoring needs for full field development.

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2. Identify all domestic/industrial wells in the area and make a baseline and annual measurement of each.
3. Prepare a well mitigation agreement for existing wells and offer it to all groundwater appropriators in the vicinity.
4. Monitoring wells need to be installed both in an updip and downdip direction, completed in coal and overburden, from the pods selected. Details of this requirement will be done in coordination with the RFO hydrologist.
5. Measure initial static water levels in all production wells.
6. Collect water quality analyses for each pod.
7. Each well must have a continuous flow meter installed to measure water production rates for the duration of the project. All water production data will be furnished to the Bureau.
8. Baseline surface water quality should be collected in each stream or receiving water that will collect or transport discharge water. The analysis will include all BLM category I, II, and III constituents.
9. The operator will provide to BLM a geologic map of the area/watershed where the produced water is to be re-injected. This should include surficial and bedrock geology, with a clear definition of recharge zones of the receiving formation/unit. The pre-injection water levels and water quality should be monitored and that data provided to BLM. The receiving aquifer should be pump tested and aquifer hydraulics reported to BLM. The reported parameters will include hydraulic conductivity, water levels and storativity for each receiving aquifer.

C. ADDITIONAL WATER MONITORING REQUIREMENTS.

The following requirements were added to the interim drilling requirements effective January 14, 2002. Where there are conflicting monitoring requirements with those described in part B of this attachment, those listed below will supersede the previous requirements.

1. One pod in each distinct geologic setting will be selected for monitoring reservoir pressures with the required monitoring well program. The location of wells used in monitoring reservoir pressures will be determined through discussion with, and approval by, the RMG and the RFO.
2. One monitoring well will be drilled in each of the three selected pods which will allow all of the necessary data to be developed and available.
3. Take pressure reading from these wells every other month for the first year and then quarterly, or on a time frame as determined by the Resource Management Group. Data collected in each interval of the multiple completion groundwater monitoring well shall include an initial four-hour, formation-pressure measurement for each perforated interval. Subsequent, periodic pressure measurements for each perforated interval will be of at least a two-hour duration unless the interval has been

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open for more than two hours or if pressure buildup or decline suggest a different time interval.

4. Use of one of the proposed production wells to monitor reservoir pressure of the coal by obtaining initial pressure and annual shut-in bottom hole pressures.

This interim drilling policy is current as of January 14, 2002. The activities, criteria, and conditions under which interim drilling are allowed are subject to change.

Appendix B

Reclamation Plan

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ATLANTIC RIM NATURAL GAS PROJECT RECLAMATION PLAN

This appendix presents a programmatic reclamation plan for the Atlantic Rim Natural Gas Project (ARPA). It gives general guidelines for completing reclamation in lieu of specific actions to take at each disturbance, as current Bureau of Land Management (BLM) policy recognizes that there may be more than one correct way to achieve successful reclamation, and a variety of methods may be appropriate to varying circumstances. BLM will continue to encourage the operators to use their expertise in recommending and implementing reclamation projects. However, the operators are responsible for attaining final reclamation standards of performance as outlined in USDI-BLM (1990a) reclamation policy. All reclamation must conform to BLM reclamation policy (USDI-BLM 1990a). Further guidance for reclamation can be found in the BLM/Forest Service "Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development" (Gold Book) found at:

<http://www.blm.gov/bmp/gold%20book/FinalGoldBook%20-%202006%20Edition.pdf>

1 Reclamation

BLM reclamation goals emphasize eventual ecosystem reconstruction, which means returning the land to a condition approximate to or better than that which existed before it was disturbed. Final reclamation measures are used to achieve this goal. BLM reclamation goals also include the short-term goal of quickly stabilizing disturbed areas to protect both disturbed and adjacent undisturbed areas from unnecessary degradation. Interim reclamation measures are used to achieve this short-term goal. As such, two types of reclamation are envisioned at the ARPA:

1. **Interim Reclamation.** Stabilization of soil by revegetation on sites that will likely be further disturbed in the future. This includes sites where re-contouring is needed at the end of the project and sites where periodic disturbance may occur due to operation and maintenance activities.
2. **Final Reclamation.** Reclamation of an area that is not planned for further disturbance including re-contouring, stabilization of soil by revegetation, and restoring the ecosystem function originally found at the site.

Among items to be emphasized in achieving these goals are:

- Stabilization of disturbed soils until the first growing season;
- Soil stabilization through establishment of a vegetative ground cover on disturbed sites during the first growing season following disturbance;
- Restoration of the native plant community disturbed or removed or restoration of an alternate vegetative regime in consultation with and approval by the BLM's Rawlins Field Office;
- Minimal disturbance of the existing environment and avoidance of riparian areas;

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- Annual monitoring and control of invasive and noxious weeds beginning the first season of disturbance;
- Monitoring and management of reclamation sites to evaluate weed populations, reclamation success, and to plan and report on the program annually; and
- Affirmative efforts to resist the spread of weeds including power washing of machinery and equipment between work sites consistent with the Rawlins Weed Prevention Plan (USDI-BLM 1999).

1.1 Management of Soil for Restoration

Topsoil should be handled separately from subsoil materials. At all construction sites, topsoil should be stripped to provide for sufficient quantities to be re-spread to a depth of at least 4 to 6 inches over the disturbed areas during reclamation. In areas where deep soils exist (such as floodplains and drainage channel terraces), at least 12 inches of topsoil should be salvaged. Where soils are shallow or where subsoil is stony, as much topsoil should be salvaged as possible.

Topsoil should be stockpiled separately from subsoil materials. Topsoil salvaged from drill sites and stored for more than 1 year should be bladed to a specified location at these areas, seeded with a prescribed seed mixture, and covered with mulch for protection from wind and water erosion and to discourage the invasion of weeds. Topsoil stockpiles anticipated to be stored for more than 1 year will be re-spread so as not to exceed a depth of 2 feet. Topsoil should be stockpiled separately from other earth materials to preclude contamination or mixing and should be marked with signs and identified on construction and design plans. Runoff should be diverted around topsoil stockpiles to minimize erosion of topsoil materials.

In most cases, disturbances will be reclaimed within 1 year. Therefore, it is unlikely that topsoil stockpiling for more than 1 year will be required. Salvaged topsoil from roads and drill sites will be respread over cut-and-fill surfaces not actively used during the production phase. Upon final reclamation, topsoil spread on these surfaces will be used for the overall reclamation effort.

1.2 Seed Mixtures

On all areas to be reclaimed, seed mixtures are required to be free of noxious weeds, composed of the same native species as were disturbed, and required to include species-promoting soil stability. A predisturbance species composition list must be developed for each site if the project encompasses an area where there are several different plant communities present. Livestock palatability and wildlife habitat needs must be given consideration in seed mix formulation. Variation of seed mixtures can be proposed and approved based on availability, climatic conditions, or variables. BLM guidance for native seed use is the BLM Manual 1745 (USDI-BLM 1992), and Executive Order 13112 (Invasive Species, 64 Federal Register 6183).

Alternate Seed Mixes. The seed mixtures identified in attachment B-1 may vary on a site-specific basis. Variations may be proposed and approved by the BLM before final reclamation. An example for the ARPA would be the addition of green needlegrass (*Stipa viridula* var. *Lodorm*) on clayey sites associated with the southern portion of the project area (e.g., Muddy Mountain area).

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Temporary Seed Mixes. Depending on BLM authorization, the following seed mixtures may be considered for erosion and weed control on sites that will be disturbed again before final reclamation. The seed mixtures contain annual cereal grasses that are not suitable for establishing a reclaimed vegetative community, but offer a temporary option to prevent halogeton invasion and establishment.

Seed should be broadcast at the rate of 50 to 100 seeds per square foot, or 15 to 25 pure live seed (PLS) pounds per acre. Another viable option is the use of a sterile triticale hybrid such as 'Quickguard®' (Granite Seed) to stabilize the disturbed area. The use of a non-sterile plant species such as wheat as a cover crop is not recommended because of its ability to reseed itself.

During reclamation within areas of important wildlife habitat (crucial winter range, sage-grouse nesting habitat, etc.), consideration shall be given for the restoration of native browse and forb species. Follow-up seeding or corrective erosion control measures will be required on areas of surface disturbance that fail to meet reclamation success standards.

Any mulch used must be certified free from mold, fungi, or noxious or invasive weed seeds. Mulch may include hay, small-grain straw, wood fiber, live mulch, cotton, jute, or synthetic netting. Straw mulch should contain fibers long enough to facilitate crimping and provide the greatest cover.

1.3 Reclamation Standards and Principles

One of the most important principles for successful restoration is to limit initial disturbance. Restoration planning should start before disturbance and be an integral part of the operational plan. Consideration of the processes necessary for successfully reclamation is important. Pre-disturbance surveys, site stabilization, weed control, and maintenance and health of soils are important considerations. Re-vegetation considering vegetative succession to pre-disturbance vegetative conditions, with annual monitoring and reporting will allow tracking of success and adaptive management of problem areas.

1.3.1 At Any Time

For each discrete site where ground-disturbing activities are planned or occur under the operators, a site-specific reclamation plan shall be prepared, submitted, and approved by the BLM before the operators disturb the environment. Guidance and requirements for this plan can be found in program-specific direction (USDI-BLM 1983). A project-wide reclamation plan may be considered if it addresses discrete site disturbances individually. The collection of photo reference points is essential.

With the exception of active work areas, disturbed areas anticipated to be left bare and exposed will be stabilized to prevent soil erosion. In addition to mulch silt fencing, waddles, hay bales, and other erosion control devices will be used on areas at risk to soil movement away from disturbed areas including fill slopes. Variation of the cover percentage and the use of other stabilizing materials can be proposed and used with BLM approval consistent with the relevant site-specific reclamation plan. For areas anticipated for further disturbance in the future, use of the seed mixtures detailed in Temporary Seed Mixtures on page would be acceptable in the interim.

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1.3.2 First Growing Season

Reclamation actions will be implemented before the first growing season following disturbance with the goal of returning the land to a condition approximate to or more productive than that which existed before disturbance or to a stable and productive condition compatible with that described in the land use plan (USDI-BLM 1990b). One strategy could include consideration of using all grasses for the first seeding so that it survives the weed-control method the first year. During subsequent seeding for final vegetation reclamation, the project shall consider using desired shrubs and forbs.

Consistent with the reclamation plan, the operator will ensure the following during the first growing season:

1. Prior to the beginning of the growing season,
 - Stabilize disturbed site soils until they are revegetated with no obstacles to germination and growth of seed, and
 - Properly prepare the site by
 - Re-contouring for permanent reclamation;
 - Completing soil preparation activities, such as ripping, straw crimping/seedbed preparation for planting including drilling and broadcast methods;
 - Planting the approved seedling/seed mixtures using site-specific methods for successful revegetation using locally adapted species; and
 - Ensuring that seed mixtures are compatible with treatment for weeds.
2. During the first growing season,
 - Monitor germination and growth of plants in the area being reclaimed;
 - Detect and control weeds in all areas—not just reclaimed areas;
 - Use adaptive management to correct establishment and growth problems;
 - Put up temporary fencing to avoid adverse effects to reclamation;
 - Build snow fencing, if requested, to increase effective precipitation and regenerate vegetation.
3. Following each growing season,
 - Review and complete a site-specific vegetation monitoring report for areas being reclaimed (table B-1) and

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- Prepare a written, site-specific prescription for actions to be implemented which may include:
 - Reseeding of areas not attaining reclamation success,
 - Soil stabilization,
 - Weed control needs, and
 - Mulching/fertilization or other cultural practices prescribed for the following season.

If the treatment area is found to be successfully reclaimed, the site will be checked for reclamation success at least annually after the growing season for at least five seasons. The site will also be checked for additional management needs including weed infestations/control needs.

If the reclamation area is not successfully reclaimed or otherwise requires further management activities to establish vegetation, the actions prescribed will be implemented as planned and further monitoring will occur as detailed beginning with Item 1 above.

1.4 Reporting Reclamation Monitoring after Successful Revegetation

The operator will provide the BLM with an annual report before December 1st for all sites disturbed. The report will include:

- Copies of the completed individual site review forms or a BLM-approved electronic report
- A summary of monitoring data and results that include:
 - Individual site reclamation monitoring reporting data (table B-1);
 - Identification of sites successfully reclaimed by reclamation years (starting with the first growing season);
 - Identification of sites needing additional work/more reclamation activities by reclamation year; and
 - Sites proposed for the end of monitoring, i.e., sites that were successfully reclaimed.
- A BLM useable shapefile(s) or Geographic Information System (GIS) layer(s) that details location, name, type, and extent of:
 - New disturbances,
 - Unreclaimed disturbance,
 - New reclamation,
 - Failed or unsuccessful reclamation,

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- Locations of noxious/invasive weed infestation, and
- Further vegetation treatments planned (e.g., mulching, matting, and weed control).

On these shapefiles or GIS layers, *location* shall be given as the legal location and geo-referenced location of the site; *name*, as the BLM Application for Permit to Drill (APD), lease, or other BLM file name for the site; and *extent*, as the amount of area and location of the item.

2 Criteria for Reclamation Success

Reclamation will be considered successful if the following criteria are met.

- 80 percent of predisturbance ground cover,
- 90 percent dominate species*,
- No noxious weeds present in the seeding, and
- Erosion features equal to or less than surrounding area.

*The vegetation will consist of species included in the seed mix and/or occurring in the surrounding natural vegetation or as deemed desirable by the BLM in review and approval of the reclamation plan. The goal is no single species will account for more than 30% total vegetative composition. Vegetation canopy cover production and species diversity shall approximate the surrounding undisturbed area.

Section 1.3.1 of this appendix indicates that reclamation success will be tracked by each discrete site for which an individual reclamation plan was prepared. A site can be nominated for successful reclamation status by the companies or the BLM any time it meets the criteria for reclamation success as outlined above. A site will be considered reclaimed and the Atlantic Rim disturbance acreage count reduced by the extent of the reclaimed acreage when the BLM authorized officer accepts the written nomination. Partially reclaimed discrete sites will not have any reclaimed acreage subtracted from the disturbance acreage count. The Atlantic Rim disturbance cap is 7,600 acres at any one time.

The BLM Rawlins Field Office (RFO) will maintain a running count of the extent of surface disturbance acres based on the “as build” geo-spatial monitoring data submitted annually for the preceding year in December by the companies following construction. An annual summary report of the disturbance acreage count will be available to the companies and the public upon written request. For a project-wide type reclamation plan (per section 1.3.1 of this appendix) each individual site disturbance included in the plan will be managed as a discrete site and disturbance acreage will be tracked as detailed above.

When determining the extent of successful reclamation, a site covered under an individual reclamation plan will be evaluated as follows. If, for example a site is determined to have 4.2 acres of total disturbance based on the “As-Built” survey, the disturbance acreage count for that discrete site will be reduced by 4.2 acres. However, if one-half acre remains disturbed in the long term (e.g. roadway) then the disturbance count for that site would be reduced by 3.7 acres when accepted as successfully reclaimed by the BLM. It should be noted that “partial credit” would not be given until all of the 3.7 acre portion is successfully reclaimed and accepted.

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Table B-1. Reclamation Monitoring Reporting Data.

General	WYW# (O&G Lease or right-of-way)
	Project Name
	Project Type (Well, Access Road, Pipeline, Facility, etc.)
	Qtr/Qtr Sec, T, R, County , State
Disturbance	Disturbance Dates
	Start-End
Reclamation	Reclamation Type (Interim/Final)
	Earthwork Contractor Name
	Earthwork & Topsoil Completion Date
	Soil Preparation Ripping Depth
	Area (Acres or Sq Ft)
Seeding	Seeding Contractor Name
	Seeding Date
	Seedbed Preparation Methods (Disc, Harrow, Depths)
	Seeding Method (Drill, Broadcast, Depths)
	Copy of Seed Tag (Species%, Purity%, Germination%)
	Actual Seeding Rate Lbs/Acre
	Area Seeded (Acres or Sq Ft)
Other	Soil Amendments Used (Describe)
	Mulching/Erosion Netting/Tackifier
	Fenced Location
	Snow Fencing
Weeds	Type(s) of weed treated
	Weed Contractor Name
	Contractor License #
	Weed Treatment Date
	Weed Treatment Type (Chemical, Mechanical)
	Chemicals Used and Rates Applied
	Area Treated (Acres or Sq Ft) (GIS extent and location)
Inspection	Inspector's name, company, ID
	Inspection Date
	Time After Seeding
	Seedlings/Sq. Ft Growing
	% and extent of Bare Soil
	% Ground Cover (Describe)
	% Desirable Species (Describe)
	% Noxious/Invasive Weeds (Describe)
	Erosion Features Present? (Describe)
	Evidence of Livestock Grazing (Describe)
Reclamation Successful (Yes/No)	
Reporting	Completed spreadsheet or database
	GIS layer with attribute table with site data as detailed
	Detail disturbance extent and location
Monitoring	Permanent Reference Point
	Reference Photos
	Close Up Photos
Future Management Prescription	Reseeding
	Weed Control needed
	Erosion control needed
	Grazing / predation issues
	Other cultural or mechanical needs

APPENDIX B.
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3 References Cited

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**APPENDIX B.
ATLANTIC RIM NATURAL GAS PROJECT RECLAMATION PLAN**

ATTACHMENT B-1

**STANDARD SEED MIXTURES
RAWLINS FIELD OFFICE**

The following list contains seed mixes recommended by resource specialists with years of local knowledge. Care and planning must be taken to choose mixes and amounts that will benefit under site specific conditions. Planning and thought must also go into selecting successful planting and site preparation techniques. All sites must be planted with a diverse mix of grasses, forbs, and shrubs to be considered successful. Industry is ultimately responsible for successful restoration of disturbed sites. Alternate seed mixes can be proposed by industry to the BLM for approval prior to use. The final goal is to restore disturbed sites so that they closely resemble pre-disturbance native plant communities.

DRY LOAMY/CLAY SITES - characterized as a sagebrush/wheatgrass community with less than 10 inches precipitation

Species of Seed	Variety	Lbs. PLS*
<u>Grasses</u>		
Streambank wheatgrass (<i>Elymus lanceolatus</i>)	Sodar	1
Thickspike wheatgrass (<i>Elymus macrourus</i>)	Critana (Bannock)	1
Western wheatgrass (<i>Agropyron smithii</i>)	Rosana	1
Indian ricegrass (<i>Oryzopsis hymenoides</i>)	Rimrock (Nez Par)	2
Bottlebrush squirreltail (<i>Elymus elymoides</i>)	Sand Hollow	2
Slender wheatgrass (<i>Elymus trachycaulus</i>)	Pyror (San Luis)	4
Little bluegrass "Sandbergh" (<i>Poa secunda</i>)	High plains	0.5
*Bluebunch wheatgrass (<i>Pseudoroegneria spicata</i>)	Secor	2
<u>Shrubs</u>		
*Big sagebrush (<i>Artemisia tridentata wyomingensis</i>)		0.5
*Gardner's saltbush (<i>Atriplex gardneri</i>)		1
*Fourwing saltbush (<i>Atriplex canescens</i>)	Wytana	1
*Shadescale (<i>Atriplex confertifolia</i>)		0.5
*Rubber rabbitbrush (<i>Ericamerica nauseosas</i>) "green"	Chrysothamnus viscidiflorus "Gray"	1
*winterfat (<i>Krascheninnikovia lanata</i>)	Open Range	0.5
<u>Forbs</u>		
*Scarlet globemallow (<i>Sphaeralcea coccinea</i>)		0.5+
*Lewis' flax (<i>Linum lewsi</i>)	Appar	0.5+
*Rocky Mountain beeplant (<i>Cleome serrulata</i>)		0.5+
*Western yarrow (<i>Achillea millefolium</i> L. var. <i>occidentalis</i>)	Yakima	0.5
*Firecracker Penstemon <i>Penstemon eatonii</i>	Richfield	1

DRY SANDY SITES - characterized as a sagebrush/bunchgrass community with less than 10 inches precipitation

Species of Seed	Variety	Lbs. PLS*
<u>Grasses</u>		
Indian ricegrass (<i>Achnatherum hymenoides</i>)	Rimrock (Nez Par)	3
Needleandthread Needlegrass (<i>Stipa comata</i>)		4
Slender wheatgrass (<i>Agropyron trachycaulum</i>)	Prior	4
*Sandhill muhly (<i>Muhlenbergia pungens</i>)		0.5
Western wheatgrass (<i>Agropyron smithii</i>)	Rosana	1
*Threadleaf sedge (<i>Carex filifolia</i>)		2

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Species of Seed	Variety	Lbs. PLS*
<u>Shrubs</u>		
*Rubber rabbitbrush (<i>Ericamerica nauseosas</i>) "green"	Chrysothamnus viscidiflorus "Gray"	1
*Wyoming Big sagebrush (<i>Artemisia tridentata wyomingensis</i>)		0.5
*Spiny hopsage (<i>Atriplex spinosa</i>)		1
*Fourwing saltbush (<i>Atriplex canescens</i>)	Wytana	1
*winterfat (<i>Krascheninnikovia lanata</i>)	Open Range	0.5

<u>Forbs</u>		
*Scarlet globemallow (<i>Sphaeralcea coccinea</i>)		0.5+
*Lewis' flax (<i>Linum lewsi</i>)	Appar	0.5+
*Rocky Mountain beeplant (<i>Cleome serrulata</i>)		0.5+

LOAMY/CLAY-LOAM SITES - characterized as a sagebrush/wheatgrass community with 10 or greater inches of precipitation

Species of Seed	Variety	Lbs. PLS*
<u>Grasses</u>		
Western wheatgrass (<i>Agropyron smithii</i>)	Rosana	1
Thickspike wheatgrass (<i>Elymus macrourus</i>)	Critana	1
Indian ricegrass (<i>Oryzopsis hymenoides</i>)	Rimrock (Nez Par)	1
Green needlegrass (<i>Stipa viridula</i>)	Lordon	3
Prairie Junegrass (<i>Koeleria cristata</i>)		1
Bottlebrush squirreltail (<i>Sitanion hystrix</i>)	Sand Hollow	1
Mutton bluegrass (<i>Poa fendleriana</i>)		0.5
Streambank wheatgrass (<i>Elymus lanceolatus</i>)	Sodar	1
Bluebunch wheatgrass (<i>Pseudoroegneria spicata</i>)	Secor	2
Basin wild rye	Trailhead	2

<u>Shrubs</u>		
*Big sagebrush (<i>Artemisia tridentata wyomingensis</i>)		0.5
*Big sagebrush (<i>Artemisia tridentata vaseyana</i>) at sites above 7,000'		0.5
*Fourwing saltbush (<i>Atriplex canescens</i>)	Wytana	1
*Antelope bitterbrush (<i>Purshia tridentata</i>)	Maybell	1
*Snowberry (<i>Symphoricarpos oreophilus</i>) and/or (<i>Sym. Albus</i>)		1
*winterfat (<i>Krascheninnikovia lanata</i>)	Open Range	0.5

<u>Forbs</u>		
*Lewis' flax (<i>Linum lewsi</i>)	Appar	0.5+
*Scarlet globemallow (<i>Sphaeralcea coccinea</i>)		0.5+
*American vetch (<i>Vicia americana</i>)		0.5+
*Lupine (<i>Lupinus sericeus</i>)		0.5+
*Blanketflower (<i>Gaillardia aristata</i>)		0.5+
*Western yarrow (<i>Achillea millefolium</i> L. var. <i>occidentalis</i>).	Yakima	0.5+
*Firecracker Penstemon <i>Penstemon eatonii</i>	Richfield	0.5+
*White sage artemesia ludiciana		0.5

SANDY SITES - characterized as a sagebrush/bunchgrass community with 10 or greater inches of precipitation

Species of Seed	Variety	Lbs. PLS*
<u>Grasses</u>		
Western wheatgrass (<i>Agropyron smithii</i>)	Rosana	1
Indian ricegrass (<i>Oryzopsis hymenoides</i>)	Rimrock (Nez Par)	2
Green needlegrass (<i>Stipa viridula</i>)		3
Needleandthread (<i>Stipa comata</i>)		2
Slender wheatgrass (<i>Agropyron trachycaulum</i>)	Prior (Revenue)	2

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Species of Seed	Variety	Lbs. PLS*
<u>Grasses (cont. from previous page)</u>		
Mutton bluegrass (<i>Poa fendleriana</i>)		0.5
Sand dropseed (<i>Sporobolus cryptandrus</i>)	Borden County	0.5
Canby Bluegrass (<i>Poa Secunda</i>)	Canbar	0.5
<u>Shrubs</u>		
*Silver sagebrush (<i>Artemisia cana</i>)		0.5
*Fourwing saltbush (<i>Atriplex canescens</i>)		1
*Antelope bitterbrush (<i>Purshia tridentata</i>)		1
*winterfat (<i>Krascheninnikovia lanata</i>)	Open Range	0.5
*White sage artemesia ludiciana		0.5
<u>Forbs</u>		
*Firecracker Penstemon <i>Penstemon eatonii</i>		
*Lewis' flax (<i>Linum lewsi</i>)	Appar	0.5+
*Rocky Mountain beeplant (<i>Cleome serrulata</i>)		0.5+
* Western yarrow <i>Achillea millefolium</i> L. var. <i>occidentalis</i> DC.		0.5+

WET ALKALINE/SALINE SITES - characterized as a greasewood community in a lowland location

Species of seed	Variety	Lbs. PLS**
<u>Grasses</u>		
Western wheatgrass (<i>Agropyron smithii</i>)	Rosana	3
Slender wheatgrass (<i>Agropyron trachycaulum</i>)	Pryor (Revenue)	4
Alkali sacaton (<i>Sporobolus airoides</i>)		0.5
Inland saltgrass (<i>Distichlis spicata</i>)		2
Basin wildrye (<i>Leymus cinereus</i>)	Trailhead	2
<u>Shrubs</u>		
*Fourwing saltbush (<i>Atriplex canescens</i>)	Wytana	1
Greasewood <i>Sarcobatus vermiculatus</i>		0.5

MOUNTAIN SHRUB SITES - characterized as shrub community with deep loamy soils and greater than 14 inches of precipitation

Species of Seed	Variety	Lbs. PLS**
<u>Grasses</u>		
Idaho fescue (<i>Festuca idahoensis</i>)		2
Green needlegrass (<i>Stipa viridula</i>)		4
Mountain brome (<i>Bromus carinatus</i>)	Garnet	2
*Oniongrass (<i>Melica bulbosa</i>)		2
Basin wildrye (<i>Leymus cinereus</i>)	Trailhead	2
Bluebunch wheatgrass (<i>Pseudoroegneria spicata</i>)	Goldar, Secor	2
<u>Shrubs</u>		
*Wyoming Big sagebrush (<i>Artemisia tridentata wyomingensis</i>)		0.5
* Mountain Big sagebrush (<i>Artemisia tridentata vaseyana</i>) at sites above 7,000'		0.5
* Silver sage (<i>Artemisia cana</i>)		0.5
*Antelope bitterbrush (<i>Purshia tridentata</i>)	Maybell	1
*Serviceberry (<i>Amelanchier alnifolia</i>)		1
*Chokecherry (<i>Prunus virginiana</i>)		1
*winterfat (<i>Krascheninnikovia lanata</i>)	Open Range	0.5
<u>Forbs</u>		
*Arrowleaf Balsamroot (<i>Balsamorhiza sagittata</i>)		
*Lewis' flax (<i>Linum lewsi</i>)	Appar	0.5+
*Scarlet globemallow (<i>Sphaeralcea coccinea</i>)		0.5+
*American vetch (<i>Vicia americana</i>)		0.5+

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Species of Seed	Variety	Lbs. PLS**
<u>Forbs (cont. from previous page)</u>		
*Lupine (<i>Lupinus sericeus</i>)		0.5+
*Blanketflower (<i>Gaillardia aristata</i>)		0.5+
* Western yarrow (<i>Achillea millefolium</i> L. var. <i>occidentalis</i>).	Yakima	0.5+
*Firecracker Penstemon <i>Penstemon eatonii</i>	Richfield	0.5+

Notes:

Total Lbs. PLS - Seed mixtures should total approximately 12-14 lbs. of pure live seed.

** Pure Live Seed, drill seeded. For broadcast seeding, double the above rates.

* These species can be used as alternatives, to fulfill shrub and forb requirements, site specific choices, or species required to fulfill a particular value (e.g., *critical wildlife habitat*).

Appendix C

Hazardous Materials Management Plan

APPENDIX C

HAZARDOUS MATERIALS MANAGEMENT PLAN

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1 Introduction

This Hazardous Materials Management Plan is provided pursuant to Bureau of Land Management (BLM) Instruction Memoranda Numbers WO-93-344 and WY-94-059, which require that all National Environmental Policy Act (NEPA) documents list and describe any hazardous and extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. Hazardous materials, as defined herein, are those substances listed in the United States Environmental Protection Agency's (USEPA's) List of Hazardous Substances (40 Code of Federal Regulations [CFR] Part 302) and extremely hazardous materials are those identified in the USEPA's List of Extremely Hazardous Substances (40 CFR Part 355). For purposes of this discussion, compounds included in the Clean Air Act Section 112(r) as the List of Substances for Accidental Release Prevention (40 CFR Part 68) are also considered hazardous materials. Materials identified on any of these lists that are expected to be used or produced by the proposed project are discussed herein.

A list of hazardous and extremely hazardous materials that are expected to be produced, used, stored, transported, or disposed of as a result of exploration and production operations was assembled into table C-1 and this management plan. Where possible, the quantities of these products or materials have been estimated on a per-well basis.

Some potentially hazardous materials that may be used in small, unquantifiable amounts have been excluded from this management plan. These materials might include:

- Wastes, as defined by the Solid Waste Disposal Act;
- Wood products, manufactured items, and articles that do not release or otherwise result in exposure to a hazardous material under normal conditions of use (e.g., steel structures, automobiles, and tires); and
- Food, drugs, tobacco products, and other miscellaneous substances (e.g., WD-40, gasket sealants, and glues).

Project personnel will be directed to properly manage and dispose of hazardous materials. Solid wastes generated at well locations will be collected in approved waste facilities (e.g., dumpsters). Each well location will be provided with one or more such facilities during drilling and completion operations. Solid wastes will be regularly removed from well locations and transported to an approved disposal facility.

Materials produced, used, stored, transported, or disposed of during the exploration and production phases of the project may be hazardous or may contain hazardous constituents. The following discussion will address the hazardous substances generally associated with the lifecycle of a coal bed methane well.

2 Production Streams

The purpose of the proposed project is to extract natural gas primarily from coal seams within the Mesaverde Group as well as from other targeted deep formations. Water and possibly liquid hydrocarbons will be produced as a result of the extraction operations. Table C-1 lists and quantifies, where possible, the hazardous and extremely hazardous substances that may be found in the production streams.

2.1 Natural Gas

Natural gas will be produced from up to approximately 1,800 coal bed methane wells, some of which will include conventional wells, within the boundaries of the project at an average rate of 0.2 million cubic feet per day per well. The natural gas produced from the wells will primarily contain methane, ethane, nitrogen, and carbon dioxide. Hexane, polynuclear aromatic hydrocarbons (PAHs), and polycyclic organic matter (POM) are hazardous substances that might be present in the gas stream. No other hazardous substances are known to occur within the natural gas stream.

The natural gas produced from the project area wells will be transported from each location through newly constructed pipelines linking well locations to existing or newly constructed centralized production facilities. Natural gas storage facilities are not expected to be used.

2.2 Produced Water

Produced water from wells within the project boundaries is expected to average 200 barrels per day per well. The water quality of the produced water will vary and will be monitored periodically. Water from the coal seams within the Mesaverde Group and other targeted formations is known to contain the following hazardous substances:

Antimony	Copper	Selenium
Arsenic	Cyanide	Silver
Barium	Lead	Sodium
Beryllium	Mercury	Thallium
Cadmium	Nickel	Zinc
Chromium	Radium 226	

Phenol, an extremely hazardous substance, is also found in the produced water stream. No other hazardous or extremely hazardous materials are known to be present.

Produced water will be re-injected into underground aquifers as permitted by the Wyoming Department of Environmental Quality (WDEQ). The water quality of the produced water will be monitored periodically. Produced water that meets applicable standards may be discharged to the surface at appropriate locations into closed systems for watering livestock or wildlife. Agency authorizations that must be obtained before disposing of produced water include:

- BLM approval of disposal methodologies,
- WDEQ Water Quality Division approval of wastewater disposal (e.g., National Pollutant Discharge Elimination System permits and Underground Injection Control permits),
- Wyoming Oil and Gas Conservation Commission (WOGCC) evaporation pond permits, and
- Wyoming State Engineer's Office dewatering permits.

2.3 Liquid Hydrocarbons

Condensate or other liquid hydrocarbon production associated with the natural gas stream is not expected from productive coal bed methane wells in the project area. Liquid hydrocarbons are likely to be produced from any successful conventional wells that might occur. Should any liquid hydrocarbons be produced, the stream would typically contain the following hazardous substances:

Benzene	POM
Ethylbenzene	Toluene
n-Hexane	Xylenes
PAHs	

No extremely hazardous materials are expected to be present in any potential liquid hydrocarbon stream.

Liquid hydrocarbons, if produced, will be stored in tanks at centralized production facilities. The tanks will be fenced and bermed to contain the entire storage capacity of the largest tank plus 1 foot of freeboard, as mandated by the BLM. Liquid hydrocarbons, if produced, will be periodically removed from the storage tanks and transported via truck outside the project area, in adherence to Department of Transportation (DOT) rules and regulations. Necessary regulatory approvals for the production, storage, and transport of liquid hydrocarbons, including the Oil Pollution Act of 1990 (storage of >1,000,000 gallons), will be addressed before the initiation of liquid hydrocarbon production activities.

3 Exploration and Production Activities

Exploration and production activities associated with the project area will include geophysical, construction, drilling, testing, completion, production, maintenance, transportation, abandonment, and reclamation components.

Known hazardous and extremely hazardous materials typically used during exploration and production operations in the project area are listed in table C-1 and generally fall into the following categories:

- Fuels,
- Lubricants,
- Coolant/antifreeze and heat transfer agents,
- Drilling fluids,
- Fracturing fluids,
- Cement and additives, and
- Miscellaneous materials.

3.1 Fuels

Gasoline, diesel, Jet A fuel, natural gas, and propane are the fuels that may be employed within the boundaries of the project area. Each of the fuels contains materials classified as hazardous. Gasoline and diesel will be used by vehicles providing transport to and from the project area. Diesel, gasoline, and Jet A fuel will be used for geophysical survey operations. Diesel fuel will also be used in drilling operations and construction equipment, and as a minor component of

APPENDIX C. HAZARDOUS MATERIALS MANAGEMENT PLAN

fracturing fluids. Natural gas produced by the proposed project will be used to power compressor engines and other ancillary facilities. Propane will be used for miscellaneous heating purposes.

3.1.1 Gasoline

Gasoline will be used to power vehicles traveling to and from the project area. Gasoline will be purchased from regional vendors and primarily stored and transported in vehicle gas tanks. Some additional gasoline may be stored in appropriately designed and labeled 1- to 5-gallon containers for supplemental use as vehicle fuel. No large-scale storage of gasoline is anticipated. The hazardous substances expected to be present in gasoline include:

Benzene	Methyl tert-butyl ether	Toluene
Cyclohexane	Naphthalene	Xylenes
Ethylbenzene	PAHs	
n-Hexane	POM	

No extremely hazardous materials are expected to be present in the gasoline.

3.1.2 Diesel

Diesel fuel will be used to power transport vehicles, geophysical vehicles, drilling rigs, and construction equipment. Each well location will have aboveground storage tanks containing diesel fuel during drilling operations. Tanks will be filled by a local fuel supplier. Diesel fuel will be used, transported, and stored in accordance with all relevant local, state, and federal rules, regulations, and guidelines. The hazardous substances expected to be present in diesel fuel include:

Benzene	POM
Ethylbenzene	Toluene
Naphthalene	Xylenes
PAHs	

No extremely hazardous materials are expected to be present in the diesel fuel.

3.1.3 Jet A Fuel

Jet A fuel will be used to power geophysical vehicles. Jet A fuel will be purchased from regional vendors and primarily stored and transported in vehicle tanks. Some additional Jet A fuel may be stored in appropriately designed and labeled containers for supplemental use. No large-scale storage of Jet A fuel is anticipated. The hazardous substances expected to be present in Jet A fuel include:

Benzene	Methyl tert-butyl ether	Toluene
Cyclohexane	Naphthalene	Xylenes
Ethylbenzene	PAHs	
n-Hexane	POM	

No extremely hazardous materials are expected to be present in the Jet A fuel.

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3.1.4 Natural Gas

Natural gas produced on site will be burned to power compressor engines and other ancillary facilities. Hazardous materials expected to be present in natural gas include n-hexane, PAHs, and POM. No extremely hazardous materials are known to exist in the natural gas from the project area.

3.1.5 Propane

Propane will be used for miscellaneous heating purposes throughout the project area. The propane will be purchased from regional vendors and transported and stored in appropriate tanks. No large-scale storage of propane is anticipated. The only hazardous material expected to be present in propane is propylene. No extremely hazardous materials are known to be present in propane.

3.2 Lubricants

Various lubricants, including motor oils, hydraulic oils, transmission oils, compressor lube oils, and greases, will be used in project equipment and machinery. Lubricants may contain hazardous substances, particularly:

Barium
Cadmium
Copper

Lead
Manganese
Nickel

PAHs
POM
Zinc

No extremely hazardous materials are known to be present in the lubricants required for the proposed project.

The lubricants will be used, stored, transported, and disposed of following manufacturers' guidelines and local, state, and federal requirements.

3.3 Coolant/Antifreeze and Heat Transfer Agents

Various materials will be used as coolant/antifreeze and heat transfer agents in association with the project. Ethylene glycol, a hazardous substance, will be used as an engine coolant/antifreeze in vehicles, construction equipment, gas dehydrators, and drilling and workover rigs. In addition, ethylene glycol will be used as a heat transfer fluid during well completion and maintenance operations. No extremely hazardous materials are known to be present in the coolant/antifreeze and heat transfer agents required for the proposed project.

Ethylene glycol will be disposed of in accordance with applicable local, state, and federal rules and regulations.

3.4 Drilling Fluids and Reserve Pit Maintenance

Water-based muds (drilling fluids) will be used for drilling each well. Drilling fluid additives consist of clays and other materials that are used in accordance with standard industry practices. Drilling fluid additives that are expected to be used during the drilling phase of coal bed methane well installation and their hazardous and extremely hazardous components are listed in table C-1. Drilling operations will be conducted in compliance with applicable BLM, WOGCC, and WDEQ rules and regulations.

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Drilling fluid additives will be transported to well locations during drilling operations in appropriate sacks and other containers, in compliance with DOT regulations.

Drilling fluids, cuttings, and water will be stored in reserve pits. The following protection actions will be employed at the reserve pits, as deemed appropriate by the BLM and WOGCC: netting (1-inch mesh) to protect waterfowl, other birds, and bats; pit liners to protect shallow groundwater aquifers and to conserve water; and perimeter fencing to protect wildlife. Following drilling and completion operations, the reserve pit contents will be evaporated or solidified in place, the pit backfilled, and the surface reclaimed. Reserve pit solidification and closure procedures will be approved by the BLM, WOGCC, or WDEQ before implementation. Alternatively, reserve pit contents may be removed and disposed of at an appropriate off-site facility in a manner commensurate with applicable local, state, and federal regulations.

3.5 Fracturing Fluids

Hydraulic fracturing is not expected to be performed on the coal bed methane wells within the project area. However, it is possible that a well will be hydraulically fractured periodically to augment gas flow rates. Fracturing fluids potentially containing hazardous substances that may be used within the project area are listed in table C-1. No extremely hazardous materials are known to be present in the fracturing fluids required for the proposed project.

Fracturing fluids and additives will be transported to well locations in bulk or in appropriately designed and labeled containers. Transportation of fracturing fluids and additives will be in adherence with DOT rules and regulations.

During fracturing, fluids are pumped under pressure down the wellbore and out through perforations in the casing into the formation. The pressurized fluid enters the formation and induces hydraulic fractures. When the pressure is released at the surface, a portion of the fracturing fluids will be forced back into the wellbore, up to the surface, and into a tank. The fracturing fluids will then be transferred to lined reserve pits and evaporated or transported off site for reuse or disposal at an authorized facility. BLM, WOGCC, and WDEQ will determine the appropriate disposal of fracturing fluids on a case-by-case basis.

3.6 Cement and Additives

Well completion and abandonment operations include cementing and plugging various segments of the wellbore to protect freshwater aquifers and other downhole resources. Materials potentially used for cementing operations include cement, calcium hydroxide, calcium chloride, pozzolans, sodium bicarbonate, potassium chloride, and insulating oil. An unknown quantity of cement and additives will be transported in bulk to each well location. These additives might contain the hazardous material classes of fine mineral fibers, PAHs, and POM. Small quantities might also be transported and stored on site in 50-pound sacks. Wells will be cased and cemented, as directed and approved by the BLM or WOGCC.

3.7 Miscellaneous Materials

Miscellaneous materials will be used during geophysical, construction, drilling, testing, completion, production, maintenance, transportation, abandonment, and reclamation activities. Miscellaneous materials potentially containing hazardous substances that might be used within the project area are listed in table C-1. Quantities of these miscellaneous materials are unknown. Materials will be transported to the site by service and supply companies and will be

APPENDIX C. HAZARDOUS MATERIALS MANAGEMENT PLAN

used, stored, transported, and disposed of following manufacturers' guidelines and local, state, and federal requirements.

In conformance with all applicable regulatory requirements, industry-standard pipeline materials, equipment, techniques, and procedures will be employed during construction, testing, operation, and maintenance activities to ensure pipeline safety and efficiency.

Small quantities of natural gas may be vented at certain well locations during testing operations. During testing, produced gas will be vented into a flare pit pursuant to the applicable BLM, WOGCC, and WDEQ rules and regulations. BLM, WOGCC, and WDEQ approval, as appropriate, will be obtained before beginning venting operations.

4 Combustion Emissions

Gasoline and diesel engines, flaring of natural gas, and fired production equipment will produce combustion emissions within the project area. The complete oxidation of hydrocarbon fuel yields only carbon dioxide and water as combustion products. However, complete combustion is seldom achieved. Unburned hydrocarbons, particulate matter, carbon monoxide, nitrogen oxides, and possibly sulfur oxides will be components of the exhaust streams. The formation of ozone from the photolysis of nitrogen oxides will also be expected. A listing of the hazardous and extremely hazardous materials potentially present in combustion emissions is provided in table C-1.

Unburned hydrocarbons might contain potentially hazardous PAHs; while, particulate matter may contain metal-based particles from metallic lubricating oil additives and engine wear. Hazardous materials in the particulate matter might therefore include compounds of lead, cadmium, nickel, copper, manganese, barium, and zinc. Particulate matter emissions and larger unburned hydrocarbons will eventually settle out onto the ground surface; whereas, gaseous emissions will react with other air constituents as components of the nitrogen, sulfur, and carbon cycles.

Nitrogen dioxide, sulfur dioxide, sulfur trioxide, and ozone are potential combustion emissions classified as extremely hazardous materials. Releases of these or other materials will not exceed allowable thresholds established by the Prevention of Significant Deterioration and WDEQ air quality regulations or the National Ambient Air Quality Standards.

5 Management Policy and Procedure

Project operators and their contractors will ensure production, use, storage, transport, and disposal of hazardous and extremely hazardous materials associated with the proposed project in strict accordance with applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. Project-related activities involving the production, use, or disposal of hazardous or extremely hazardous materials will be conducted in such a manner so as to minimize potential environmental impacts.

Project operators will comply with emergency reporting requirements for releases of hazardous materials. Releases of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR Part 117, will be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended. The materials for which such notification must be given are the extremely hazardous substances listed under the Emergency Planning and Community Right to Know Act,

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Section 302, and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, prompt notice of the release will be given to the BLM's Authorized Officer and other appropriate local, state, and federal agencies.

In addition, notice of any spill or leakage (i.e., any undesirable event), as defined in BLM NTL-3A, shall be given to the Authorized Officer and other such local, state, and federal officials, as required by law.

Project operators will prepare and implement, as necessary, the following plans and policies:

- Spill prevention and control countermeasure plans;
- Storm water pollution prevention plans;
- Liquid hydrocarbon spill response plans;
- Inventories of hazardous chemical categories pursuant to Section 312 of the Superfund Amendments and Reauthorization Act, as amended; and
- Emergency response plans.

Copies of the above will be maintained by the operators, as required by regulation, and will be made available upon request.

Exploration and production activities in the project area will comply with regulations promulgated under the Resource Conservation and Recovery Act, CERCLA, the Clean Water Act, the Safe Drinking Water Act, the Toxic Substances Control Act, the Occupational Safety and Health Act, the Clean Air Act, and NEPA as appropriate. In addition, project activities will also comply with applicable state rules and regulations relating to hazardous material handling, storage, transportation, management, disposal, and reporting.

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Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Production Streams				
Natural Gas				0.2 mmcfd
	n-Hexane		110-54-3	
	PAHs		-	
	POM		-	
Produced Water				200 bpd
	Antimony		7440-36-0	
	Arsenic		7440-38-2	
	Barium		7440-39-3	
	Beryllium		7440-41-7	
	Cadmium		7440-43-9	
	Chromium		7440-47-3	
	Copper		7440-50-8	
	Cyanide		-	
	Lead		7439-92-1	
	Mercury		7439-97-6	
	Nickel		7440-02-0	
		Phenols	108-95-2	
	Radium 226		-	
	Selenium		7782-49-2	
	Silver		7440-22-4	
	Sodium		7440-23-5	
	Thallium		7440-28-0	
	Zinc		7440-66-6	
Liquid Hydrocarbons				UNK
	Benzene		71-43-2	
	Ethylbenzene		100-41-4	
	n-Hexane		110-54-3	
	PAHs		-	
	POM		-	
	Toluene		108-88-3	
	Xylenes		1330-20-7	
Fuels				
Gasoline				UNK
	Benzene		71-43-2	
	Cyclohexane		110-82-7	
	Ethylbenzene		100-41-4	
	n-Hexane		110-54-3	
	Methyl tert-butyl ether		1634-04-4	
	Naphthalene		91-20-3	
	PAHs		-	
	POM		-	
	Toluene		108-88-3	
	Xylenes		1330-20-7	

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Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Diesel	Benzene		71-43-2	UNK
	Ethylbenzene		10041-4	
	Naphthalene		91-20-3	
	PAHs		-	
	POM		-	
	Toluene		108-88-3	
	Xylenes		108-38-3	
Jet A Fuel	Benzene		71-43-2	UNK
	Cyclohexane		110-82-7	
	Ethylbenzene		100-41-4	
	n-Hexane		110-54-3	
	Methyl tert-butyl ether		1634-04-4	
	Naphthalene		91-20-3	
	PAHs		-	
	POM		-	
	Toluene		108-88-3	
	Xylenes		108-38-3	
Natural Gas	n-Hexane		110-54-3	UNK
	PAHs		-	
	POM		-	
Propane				UNK
Lubricants	Propylene		115-07-1	UNK
	Barium		7440-39-3	
	Cadmium		7440133-9	
	Copper		7440-50-8	
	Lead		7439-92-1	
	Manganese		7439-96-5	
	Nickel		7440-02-0	
	PAHs		-	
	POM		-	
	Zinc		7440-66-6	
	Coolant/Antifreeze And Heat Transfer Agents			
	Ethylene glycol		107-21-1	
Drilling Fluids	Barite	Barium compounds	-	16,000 lb
		Fine mineral fibers	-	
	Bentonite	Fine mineral fibers	-	45,000 lb
	Caustic Soda	Sodium hydroxide	1310-73-2	750 lb
	Glutaraldehyde	Isopropyl alcohol	67-63-0	20 gal
	Lime	Fine mineral fibers	-	3,500 lb

APPENDIX C. HAZARDOUS MATERIALS MANAGEMENT PLAN

Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Mica	Fine mineral fibers		-	600 lb
Modified Tannin	Ferrous sulfate		7720-78-7	250 lb
	Fine mineral fibers		-	
Phosphate Esters	Methanol		67-56-1	100 gal
Polyacrylamides		Acrylamide	79-06-1	100 gal
	PAHs		-	
	POM		-	
Retarder	Fine mineral fibers		-	400 lb
Fracturing Fluids				
Biocides	Fine mineral fibers		-	UNK
	PAHs		-	
	POM		-	
Breakers	Copper compounds		-	UNK
	Ethylene glycol		107-21-1	
	Fine mineral fibers		-	
	Glycol ethers		-	
Clay Stabilizer	Fine mineral fibers		-	UNK
	Glycol ethers		-	
	Isopropyl alcohol		67-63-0	
	Methanol		67-56-1	
	PAHs		-	
	POM		-	
Crosslinkers	Ammonium chloride		12125-02-9	UNK
	Methanol		67-56-1	
	Potassium hydroxide		1310-58-3	
	Zirconium nitrate		13746-89-9	
	Zirconium sulfate		14644-61-2	
Foaming Agent	Glycol ethers		-	UNK
Gelling Agent	Benzene		71-43-2	UNK
	Ethylbenzene		100-41-4	
	Methyl tert-butyl ether		1634-04-4	
	Napthalene		91-20-3	
	PAHs		-	
	POM		-	
	Sodium hydroxide		1310-73-2	
	Toluene		108-88-3	
	Xylenes		1330-20-7	
Ph Buffers	Acetic acid		64-19-7	UNK
	Benzoic acid		65-85-0	

APPENDIX C. HAZARDOUS MATERIALS MANAGEMENT PLAN

Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Ph Buffers	Fumaric acid		110-17-8	
	Hydrochloric acid		7647-01-0	
	Sodium hydroxide		1310-73-2	
Sands	Fine mineral fibers		-	UNK
Solvents	Glycol ethers		-	UNK
Surfactants	Glycol ethers		-	UNK
	Isopropyl alcohol		67-63-0	
	Methanol		67-56-1	
	PAHs		-	
	POM		-	
Cement And Additives				
Anti-Foamer	Glycol ethers		-	100 lb
Calcium Chloride Flake	Fine mineral fibers		-	2,500 lb
Cellophane Flake	Fine mineral fibers		-	300 lb
Cement	Aluminum oxide		1344-28-1	77,000 lb
	Fine mineral fibers		-	
Chemical Wash	Ammonium hydroxide		1336-21-6	850 gal
	Glycol ethers		-	
Diatomaceous Earth	Fine mineral fibers		-	1,000 lb
Extenders	Aluminum oxide		1344-28-1	17,500 lb
	Fine mineral fibers		-	
Fluid Loss Additive		Acrylamide	79-06-1	900 lb
	Fine mineral fibers		-	
	Naphthalene		91-20-3	
Friction Reducer	Fine mineral fibers		-	160 lb
	Naphthalene		91-20-3	
	PAHs		-	
	POM		-	
Mud Flash	Fine mineral fibers		-	250 lb
Retarder	Fine mineral fibers		-	100 lb

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Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Salt	Fine mineral fibers		-	2,570 lb
Silica Flour	Fine mineral fibers		-	4,800 lb
Miscellaneous Materials				
Acids	Acetic anhydride		108-24-7	UNK
	Formic acid		64-18-6	
	Sodium chromate		777-11-3	
	Sulfuric acid		7664-93-9	
Batteries	Cadmium		744043-9	UNK
		Cadmium oxide	1306-19-0	
	Lead		7439-92-1	
	Nickel hydroxide		7440-02-0	
	Potassium hydroxide		1310-58-3	
		Sulfuric acid	7664-93-9	
Biocides		Formaldehyde	50-00-0	UNK
	Isopropyl alcohol		67-63-0	
	Methanol		67-56-1	
Cleaners	Hydrochloric acid		7647-01-0	UNK
Corrosion Inhibitors	4,4' Methylene dianiline		101-77-9	UNK
	Acetic acid		64-19-7	
	Ammonium bisulfite		10192-30-0	
	Diethylamine		109-89-7	
	Dodecylbenzenesulfonic acid		27176-87-0	
	Ethylene glycol		107-21-1	
	Isobutyl alcohol		78-83-1	
	Isopropyl alcohol		67-63-0	
	Methanol		67-56-1	
	Naphthalene		91-20-3	
	Sodium nitrite		7632-00-0	
	Toluene		108-88-3	
	Xylenes		1330-20-7	
Corrosion Inhibitors	Zinc carbonate		3486-35-9	
Emulsion Breakers	Acetic acid		64-19-7	UNK
	Acetone		67-64-1	
	Ammonium chloride		12125-02-9	
	Benzoic acid		65-85-0	
	Isopropyl alcohol		67-63-0	
	Methanol		67-56-1	
	Naphthalene		91-20-3	

APPENDIX C. HAZARDOUS MATERIALS MANAGEMENT PLAN

Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Emulsion Breakers	Toluene		108-88-3	
	Xylenes		1330-20-7	
	Zinc chloride		7646-85-7	
Explosives, Fuses, Detonators, and Boosters	Benzene		71-43-2	UNK
	Ethylbenzene		100-41-4	
	Ethylene glycol		107-21-1	
	Lead compounds		7439-92-1	
	Methyl tert-butyl ether		1634-04-0	
	Naphthalene		91-20-3	
	Nitric acid		7697-37-2	
	Nitroglycerine		55-63-0	
	PAHs		-	
	POM		-	
	Toluene		108-88-3	
Xylenes		1330-20-7		
Fertilizers	UNK		-	UNK
Herbicides	UNK		-	UNK
Lead-Free Thread Compound	Copper		7440-50-8	25 gal
	Zinc		7440-66-6	
Methanol	Methanol		67-56-1	200 gal
Motor Oil	Zinc compounds		-	220 gal
Paints	Barium		7440-39-3	UNK
	n-Butyl alcohol		71-36-3	
	Cobalt		7440-48-4	
	Lead		7439-92-1	
	Manganese		7439-96-5	
	PAHs		-	
	POM		-	
	Sulfuric acid		7664-93-9	
	Toluene		108-88-3	
	Triethylamine		121-44-8	
Xylenes		1330-20-7		
Paraffin Control		Carbon disulfide	75-15-0	UNK
Paraffin Control	Ethylbenzene		100-41-4	
	Methanol		67-56-1	
	Toluene		108-88-3	
	Xylenes		1330-20-7	
Photoreceptors	Selenium		7782-49-2	UNK

APPENDIX C. HAZARDOUS MATERIALS MANAGEMENT PLAN

Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Pipeline				
Coating	Aluminum oxide		1334-28-1	UNK
Cupric Sulfate Solution	Cupric sulfate	Sulfuric acid	7758-98-7 7664-93-9	UNK
Diethanolamine	Diethanolamine		111-42-2	UNK
LP Gas	Benzene n-Hexane Propylene		71-43-2 110-54-3 115-07-1	UNK
Molecular Sieves	Aluminum oxide		1344-28-1	UNK
Pipeline Primer	Naphthalene Toluene		91-20-3 108-88-3	UNK
Potassium Hydroxide Solution	Potassium hydroxide		1310-58-3	UNK
Rubber Resin Coatings	Acetone Ethyl acetate Methyl ethyl ketone Toluene Xylene		67-64-1 141-78-6 78-93-3 108-88-3 1330-20-7	UNK
Scale Inhibitors	Acetic acid Ethylene diamine tetraacetic acid Ethylene glycol Formaldehyde Hydrochloric acid Isopropyl alcohol Methanol Nitrilotriacetic acid		64-19-7 60-00-4 107-21-1 50-00-0 7647-01-0 67-63-1 67-56-1 139-13-9	UNK
Sealants	1,1,1-trichloroethane n-Hexane PAHs POM		71-55-6 110-54-3 - -	UNK
Solvents	1,1,1-trichloroethane Acetone t-Butyl alcohol Carbon tetrachloride Isopropyl alcohol Methyl ethyl ketone		71-55-6 67-64-1 75-65-0 56-23-5 67-63-0 108-10-1	UNK

APPENDIX C. HAZARDOUS MATERIALS MANAGEMENT PLAN

Table C-1. Hazardous and Extremely Hazardous Materials Potentially Used or Produced during Construction, Drilling, Production, and Reclamation Operations

Source	Hazardous Substances ¹	Extremely Hazardous Substances ²	Cas No.	Approximate Quantities Used or Produced Per Well
Solvents	Methanol		67-56-1	
	PAHs		-	
	POM		-	
	Toluene		108-88-3	
	Xylenes		1330-20-7	
Starting Fluid	Ethyl ether		60-29-7	UNK
Surfactants		Ethylene diamine	107-15-3	UNK
	Isopropyl alcohol		67-56-1	
Combustion Emissions				
Combustion Products		Formaldehyde	50-00-0	XXXX
		Nitrogen dioxide	10102-44-0	XXXX
		Ozone	10028-15-6	XXXX
		Sulfur dioxide	7446-09-5	XXXX
		Sulfur trioxide	7446-11-9	XXXX
Unburned Hydrocarbons	Benzene		71-43-2	XXXX
	Ethylbenzene		100-41-4	
	n-Hexane		100-54-3	
	PAHs		-	
	Toluene		108-88-3	
	Xylenes		1330-20-7	
Particulate Matter	Barium		7440-39-3	XXXX
	Cadmium		7440-43-9	
	Copper		7440-50-8	
	Fine mineral fibers		-	
	Lead		7439-92-1	
	Manganese		7439-96-5	
	Nickel		7440-02-0	
	POM		-	
	Zinc		7440-66-6	

Notes:

¹ Hazardous Substances include those compounds identified in USEPA's List of Hazardous Substances (40 CFR Part 302) and List of Substances for Accidental Release Prevention (40 CFR Part 68).

² Extremely Hazardous Substances include those compounds identified in USEPA's List of Extremely Hazardous Substances (40 CFR Part 355).

bpd - barrels per day

lb - pounds

gal - gallons

mmcf - million cubic feet per day

PAHs - Polynuclear aromatic hydrocarbons

POM - Polycyclic organic matter

UNK - unknown

Appendix D

Wildlife and Fish Species Lists

APPENDIX D

WILDLIFE AND FISH SPECIES LISTS

Table D-1. Wildlife Species Observed or that May Potentially Occur on or near the Atlantic Rim Project Area.

Common Name	Scientific Name	Data Sources*			
		WOS	ATLAS	WYNDD	HWA
MAMMALS					
Badger	<i>Taxidea taxus</i>	y	y		y
Bighorn sheep	<i>Ovis canadensis</i>	y			
Beaver	<i>Castor canadensis</i>	y	y		
Big-brown bat	<i>Eptesicus fuscus</i>		y		
Bison	<i>Bison bison</i>	y	y		
Black bear	<i>Ursus americanus</i>	y	y		
Black-footed ferret	<i>Mustela nigripes</i>		y		
Bobcat	<i>Felis rufus</i>	y	y		y
Bushy-tailed wood rat	<i>Neotoma cinerea</i>	y	y		
Cliff chipmunk	<i>Tamias dorsalis</i>		y		
Coyote	<i>Canis latrans</i>	y	y		y
Deer mouse	<i>Peromyscus maniculatus</i>	y	y		y
Desert cottontail	<i>Sylvilagus audubonii</i>	y	y		y
Dusky shrew	<i>Sorex monticolus</i>		y		
Dwarf shrew	<i>Sorex nanus</i>		y	y	
Eastern cottontail	<i>Sciurus carolinensis</i>	y			
Eastern red bat	<i>Lasiurus borealis</i>	y	y		
Eastern fox squirrel	<i>Sciurus niger</i>		y		
Elk	<i>Cervus elaphus</i>	y	y		y
Feral horse	<i>Equus caballus</i>	y			y
Golden-mantled ground squirrel	<i>Spermophilus lateralis</i>	y	y		
Grizzly bear	<i>Ursus arctos</i>		y		
Hoary bat	<i>Lasiurus cinereus</i>		y	y	
Least chipmunk	<i>Tamias minimus</i>	y	y		y
Little brown myotis	<i>Myotis lucifugus</i>		y		
Long-eared myotis	<i>Myotis evotis</i>		y	y	
Long-tailed vole	<i>Microtus longicaudus</i>		y		
Long-tailed weasel	<i>Mustela frenata</i>	y	y		y
Marten	<i>Martes americana</i>	y	y		
Masked shrew	<i>Sorex cinereus</i>	y	y		
Meadow vole	<i>Microtus pennsylvanicus</i>	y			
Merriam's shrew	<i>Sorex merriami</i>		y		
Mink	<i>Mustela vison</i>	y	y		
Montane vole	<i>Microtus montanus</i>	y	y		
Moose	<i>Alces alces shirasi</i>	y	y		
Mountain (Nuttall's) cottontail	<i>Sylvilagus nuttallii</i>	y	y		
Mountain lion	<i>Felis concolor</i>	y	y		
Mule deer	<i>Odocoileus hemionus</i>	y	y		y
Muskrat	<i>Ondatra zibethicus</i>	y	y		y

APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Data Sources*

Common Name	Scientific Name	WOS	ATLAS	WYNDD	HWA
Northern grasshopper mouse	<i>Onychomys leucogaster</i>	y	y		
Northern pocket gopher	<i>Thomomys talpoides</i>		y		
Olive-backed pocket mouse	<i>Perognathus fasciatus</i>	y	y		
Ord's kangaroo rat	<i>Dipodomys ordii</i>	y	y		y
Pika	<i>Ochotona princeps</i>		y		
Porcupine	<i>Erethizon dorsatum</i>	y	y		y
Pronghorn antelope	<i>Antilocapra americana</i>	y	y		y
Raccoon	<i>Procyon lotor</i>	y	y		
Red fox	<i>Vulpes vulpes</i>	y	y		
Red squirrel	<i>Tamiasciurus hudsonicus</i>	y	y		
Ringtail	<i>Bassariscus astutus</i>			y	
Sagebrush vole	<i>Lemmyscus curtatus</i>	y	y		
Short-tailed (ermine) weasel	<i>Mustela erminea</i>		y		
Silky pocket mouse	<i>Perognathus flavus</i>		y		
Silver-haired bat	<i>Lasionycteris noctivagans</i>	y	y		
Snowshoe hare	<i>Lepus americanus</i>	y	y		
Southern red-backed vole	<i>Clethrionomys gapperi</i>	y	y		
Spotted ground squirrel	<i>Spermophilus spilosoma</i>		y		
Striped skunk	<i>Mephitis mephitis</i>	y	y		
Swift fox	<i>Vulpes velox</i>		y		
Thirteen-lined ground squirrel	<i>Spermophilus tridecemlineatus</i>	y	y		
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>			y	
Uinta ground squirrel	<i>Spermophilus armatus</i>		y		
Water shrew	<i>Sorex palustris</i>		y		
Western heather vole	<i>Phenacomys intermedius</i>		y		
Western jumping mouse	<i>Zapus princeps</i>	y	y		
Western small-footed myotis	<i>Myotis ciliolabrum</i>	y	y		
Western spotted skunk	<i>Spilogale gracilis</i>			y	
White-tailed deer	<i>Odocoileus virginianus</i>	y	y		
White-tailed jackrabbit	<i>Lepus townsendii</i>	y	y		y
White-tailed prairie dog	<i>Cynomys leucurus</i>	y	y	y	y
Wyoming ground squirrel	<i>Spermophilus elegans</i>	y	y		y
Wyoming pocket gopher	<i>Thomomys clusius</i>		y	y	
Yellow-bellied marmot	<i>Marmota flaviventris</i>	y	y		
BIRDS					
American avocet	<i>Recurvirostra americana</i>	y	y		y
American bittern	<i>Botaurus lentiginosus</i>	y	y		
American coot	<i>Fulica americana</i>	y	y		y
American crow	<i>Corvus brachyrhynchos</i>	y	y		y
American dipper	<i>Cinclus mexicanus</i>	y	y		
American goldfinch	<i>Carduelis tristis</i>	y	y		
American kestrel	<i>Falco sparverius</i>	y	y		y
American pipit	<i>Anthus rubescens</i>	y	y		
American redstart	<i>Setophaga ruticilla</i>	y	y		
American robin	<i>Turdus migratorius</i>	y	y		y

APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Data Sources*

Common Name	Scientific Name	WOS	ATLAS	WYNDD	HWA
American tree sparrow	<i>Spizella arborea</i>	y	y		
American white pelican	<i>Pelecanus erythrorhynchos</i>	y	y		
American wigeon	<i>Anas Americana</i>	y	y		y
Ash-throated flycatcher	<i>Myiarchus cinerascens</i>		y		
Baird's sandpiper	<i>Calidris bairdii</i>	y	y		
Baird's sparrow	<i>Ammodramus bairdii</i>	y			
Bald eagle	<i>Haliaeetus leucocephalus</i>	y	y	y	
Baltimore oriole	<i>Icterus galbula</i>	y			
Bank swallow	<i>Riparia riparia</i>	y	y		y
Barn swallow	<i>Hirundo rustica</i>	y	y		
Barrow's goldeneye	<i>Bucephala islandica</i>		y		
Belted kingfisher	<i>Ceryle alcyon</i>	y	y		
Bewick's wren	<i>Thryomanes bewickii</i>	y	y		
Black rosy-finch	<i>Leucosticte atrata</i>		y		
Black tern	<i>Chlidonias niger</i>	y	y		
Black-and-white warbler	<i>Mniotilta varia</i>		y		
Black-bellied plover	<i>Pluvialis dominicus</i>	y	y		
Black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>		y		
Black-billed magpie	<i>Pica pica</i>	y	y		y
Black-capped chickadee	<i>Parus atricapillus</i>	y	y		
Black-chinned hummingbird	<i>Archilochus alexandri</i>			y	
Black-crowned night heron	<i>Nycticorax nycticorax</i>	y	y		
Black-headed grosbeak	<i>Pheucticus melanocephalus</i>	y	y		
Black-necked stilt	<i>Himantopus mexicanus</i>	y	y		
Black-throated gray warbler	<i>Dendroica caerulescens</i>		y	y	
Blue grosbeak	<i>Guiraca caerulea</i>		y		
Blue grouse	<i>Dendragapus obscurus</i>	y	y		
Blue jay	<i>Cyanocitta cristata</i>		y		
Blue-gray gnatcatcher	<i>Polioptila caerulea</i>	y	y		
Blue-winged teal	<i>Anas discors</i>	y	y		y
Bobolink	<i>Dolichonyx oryzivorus</i>	y	y	y	?
Bohemian waxwing	<i>Bombycilla garrulus</i>		y		
Bonaparte's gull	<i>Spizella breweri</i>	y	y		
Brewer's sparrow	<i>Euphagus cyanocephalus</i>	y	y	y	y
Brewer's blackbird	<i>Selasphorus platycercus</i>	y	y		
Broad-tailed hummingbird	<i>Selasphorus platycercus</i>	y	y		
Broad-winged hawk	<i>Buteo platypterus</i>		y		
Brown creeper	<i>Certhia americana</i>	y	y		
Brown thrasher	<i>Taxostoma rufum</i>	y	y		
Brown-capped rosy-finch	<i>Leucosticte australis</i>		y		
Brown-headed cowbird	<i>Molothrus ater</i>	y	y		y
Buff-breasted sandpiper	<i>Tryngites subruficollis</i>	y	y		
Bufflehead	<i>Bucephala albeola</i>	y	y		y
Burrowing owl	<i>Athene cunicularia</i>	y	y	y	y
California gull	<i>Larus californicus</i>	y	y		
Canada goose	<i>Branta canadensis</i>	y	y		y

APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Common Name	Scientific Name	Data Sources*			
		WOS	ATLAS	WYNDD	HWA
Canvasback	<i>Aythya valisineria</i>	y	y		
Canyon wren	<i>Catherpes mexicanus</i>	y	y		
Cassin's finch	<i>Carpodacus cassinii</i>	y	y		
Cattle egret	<i>Bubulcus ibis</i>		y		
Cedar waxwing	<i>Bombycilla cedrorum</i>		y		
Chestnut-collared longspur	<i>Calcarius ornatus</i>	y			
Chipping sparrow	<i>Spizella passerina</i>	y	y		
Cinnamon teal	<i>Anas cyanoptera</i>	y	y		y
Clark's nutcracker	<i>Nucifraga columbiana</i>	y	y		
Cliff swallow	<i>Hirundo pyrrhonota</i>	y	y		
Common goldeneye	<i>Bucephala clangula</i>		y		
Common grackle	<i>Quiscalus quiscula</i>	y	y		
Common merganser	<i>Mergus merganser</i>	y	y		y
Common nighthawk	<i>Chordeiles minor</i>	y	y		
Common poorwill	<i>Phalaenoptilus nuttallii</i>	y	y		
Common raven	<i>Corvus corax</i>	y	y		y
Common snipe	<i>Gallinago gallinago</i>	y	y		y
Common tern	<i>Sterna hirundo</i>	y			
Common yellowthroat	<i>Geothlypis trichas</i>	y	y		
Cooper's hawk	<i>Accipiter cooperii</i>	y	y		
Cordilleran fly catcher	<i>Empidonax occidentalis</i>	y	y		
Dark-eyed junco	<i>Junco hyemalis</i>	y	y		
Double-crested cormorant	<i>Phalacrocorax auritus</i>	y	y		
Downy woodpecker	<i>Picoides pubescens</i>	y	y		
Dusky flycatcher	<i>Empidonax oberholseri</i>	y	y		
Eared grebe	<i>Podiceps nigricollis</i>	y	y		
Eastern kingbird	<i>Tyrannus tyrannus</i>	y	y		
Eastern screech owl	<i>Otus asio</i>	y			
European starling	<i>Sturnus vulgaris</i>	y	y		y
Evening grosbeak	<i>Coccothraustes vespertinus</i>	y	y		
Ferruginous hawk	<i>Buteo regalis</i>	y	y		y
Field sparrow	<i>Spizella pusilla</i>	y			
Forster's tern	<i>Sterna forsteri</i>	y	y		
Fox sparrow	<i>Passerella iliaca</i>	y	y		
Franklin's gull	<i>Larus pipixcan</i>	y	y		
Gadwall	<i>Anas strepera</i>	y	y		y
Golden eagle	<i>Aquila chrysaetos</i>	y	y		y
Golden-crowned kinglet	<i>Regulus satrapa</i>	y	y		
Grasshopper sparrow	<i>Ammodramus savannarum</i>	y			
Gray catbird	<i>Dumetella carolinensis</i>	y	y		
Gray flycatcher	<i>Empidonax wrightii</i>	y	y		
Gray jay	<i>Perisoreus canadensis</i>	y	y		
Gray-crowned rosy-finch	<i>Leucosticte tephrocotis</i>	y	y		
Great-blue heron	<i>Ardea herodias</i>	y	y		
Greater yellowlegs	<i>Tringa melanoleuca</i>	y	y		
Great horned owl	<i>Bubo virginianus</i>	y	y		y

APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Data Sources*

Common Name	Scientific Name	WOS	ATLAS	WYNDD	HWA
Green heron	<i>Butorides virescens</i>	y	y		
Green-tailed towhee	<i>Pipilo chlorurus</i>	y	y		
Green-winged teal	<i>Anas crecca</i>	y	y		y
Hairy woodpecker	<i>Picoides villosus</i>	y	y		
Hammond's flycatcher	<i>Empidonax hammondii</i>		y	y	
Horned grebe	<i>Podiceps auritus</i>	y			
Hermit thrush	<i>Catharus guttatus</i>	y	y		
Herring gull	<i>Larus argentatus</i>	y			
Horned lark	<i>Eremophila alpestris</i>	y	y		y
House finch	<i>Carpodacus mexicanus</i>	y	y		
House sparrow	<i>Passer domesticus</i>		y		
House wren	<i>Troglodytes aedon</i>	y	y		
Hudsonian godwit	<i>Limosa haemastica</i>	y			
Indigo bunting	<i>Passerina cyanea</i>		y		
Killdeer	<i>Charadrius vociferus</i>	y	y		y
Lark bunting	<i>Calamospiza melanocorys</i>	y	y		
Lark sparrow	<i>Chondestes grammacus</i>	y	y		
Lazuli bunting	<i>Passerina amoena</i>		y		
Least flycatcher	<i>Empidonax minimus</i>		y		
Least sandpiper	<i>Calidris minutilla</i>	y	y		
Lesser scaup	<i>Aythya affinis</i>	y	y		y
Lesser yellowlegs	<i>Tringa flavipes</i>	y	y		
Lewis' woodpecker	<i>Melanerpes lewis</i>	y	y	y	
Lincoln's sparrow	<i>Melospiza lincolnii</i>		y		
Loggerhead shrike	<i>Lanius ludovicianus</i>	y	y		y
Long-billed curlew	<i>Numenius americanus</i>	y	y		
Long-billed dowitcher	<i>Limnodromus scolopaceus</i>	y	y		y
Long-eared owl	<i>Asio otus</i>	y	y		
Macgillivray's warbler	<i>Oporornis tolmiei</i>	y	y		
Mallard	<i>Anas platyrhynchos</i>	y	y		y
Marbled godwit	<i>Limosa fedora</i>	y	y		
Marsh wren	<i>Cistothorus palustris</i>	y	y		
McCown's longspur	<i>Calcarius mccownii</i>		y	y	
Merlin	<i>Falco columbarius</i>	y	y	y	y
Mountain bluebird	<i>Sialia currucoides</i>	y	y		y
Mountain chickadee	<i>Parus gambeli</i>	y	y		
Mountain plover	<i>Charadrius montanus</i>	y	y	y	y
Mourning dove	<i>Zenaida macroura</i>	y	y		y
Northern (Bullock's) oriole	<i>Icterus bullockii</i>		y		
Northern flicker	<i>Colaptes auratus</i>	y	y		y
Northern goshawk	<i>Accipiter gentilis</i>	y	y	y	
Northern harrier	<i>Circus cyaneus</i>	y	y		y
Northern mockingbird	<i>Mimus polyglottos</i>		y		
Northern pintail	<i>Anas acuta</i>	y	y		y
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	y	y		
Northern saw-whet owl	<i>Aegolius acadicus</i>		y		

APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Common Name	Scientific Name	Data Sources*			
		WOS	ATLAS	WYNDD	HWA
Northern shoveler	<i>Anas clypeata</i>	y	y		
Northern shrike	<i>Lanius excubitor</i>	y	y		
Northern waterthrush	<i>Seiurus noveboracensis</i>		y		
Olive-sided flycatcher	<i>Contopus borealis</i>	y	y		
Orange-crowned warbler	<i>Vermivora celata</i>	y	y		
Ovenbird	<i>Seiurus aurocapillus</i>		y		
Osprey	<i>Pandion haliaetus</i>	y			
Pectoral sandpiper	<i>Calidris melanotos</i>	y	y		
Peregrine falcon	<i>Falco peregrinus</i>	y	y		
Pied billed grebe	<i>Podilymbus podiceps</i>	y	y		
Pine grosbeak	<i>Pinicola enucleator</i>		y		
Pine siskin	<i>Carduelis pinus</i>	y	y		
Pinyon jay	<i>Gymnorhinus cyanocephalus</i>	y	y		
Plain titmouse	<i>Baeolophus griseus</i>	y		y	
Prairie falcon	<i>Falco mexicanus</i>	y	y		y
Red crossbill	<i>Loxia curvirostra</i>	y	y		
Red-breasted merganser	<i>Mergus serrator</i>		y		
Red-breasted nuthatch	<i>Sitta canadensis</i>	y	y		
Red-eyed vireo	<i>Vireo olivaceus</i>		y		
Redhead	<i>Aythya americana</i>	y	y		
Red-naped sapsucker	<i>Sphyrapicus nuchalis</i>	y	y		
Red-necked grebe	<i>Podiceps grisegena</i>	y			
Red-necked phalarope	<i>Phalaropus lobatus</i>	y	y		
Red-tailed hawk	<i>Buteo jamaicensis</i>	y	y		y
Red-winged blackbird	<i>Agelaius phoeniceus</i>	y	y		
Ring-billed gull	<i>Larus delawarensis</i>	y	y		
Ring-necked duck	<i>Aythya collaris</i>	y	y		y
Ring-necked pheasant	<i>Phasianus colchicus</i>	y			
Rock dove	<i>Columba livia</i>		y		
Rock wren	<i>Salpinctes obsoletus</i>	y	y		
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	y			
Rough-legged hawk	<i>Buteo lagopus</i>	y	y		
Ruby-crowned kinglet	<i>Regulus calendula</i>	y	y		
Ruddy duck	<i>Oxyura jamaicensis</i>	y	y		y
Ruddy turnstone	<i>Arenaria interpres</i>	y	y		
Rufous hummingbird	<i>Selasphorus rufus</i>		y		
Greater sage-grouse	<i>Centrocercus urophasianus</i>	y	y		y
Sage sparrow	<i>Amphispiza belli</i>	y	y	y	
Sage thrasher	<i>Oreoscoptes montanus</i>	y	y		y
Sanderling	<i>Calidris alba</i>	y	y		
Sandhill crane	<i>Grus canadensis</i>	y	y		
Savannah sparrow	<i>Passerculus sandwichensis</i>	y	y		
Say's phoebe	<i>Sayornis saya</i>	y	y		
Scott's oriole	<i>Icterus parisorum</i>		y	y	
Semipalmated plover	<i>Charadrius semiplamatus</i>	y	y		
Semipalmated sandpiper	<i>Calidris pusilla</i>	y	y		

APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Data Sources*

Common Name	Scientific Name	WOS	ATLAS	WYNDD	HWA
Sharp-shinned hawk	<i>Accipiter striatus</i>	y	y		
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>	y	y	y	
Short-eared owl	<i>Asio flammeus</i>	y	y	y	
Snow bunting	<i>Plectrophenax nivalis</i>	y	y		
Snow goose	<i>Chen caerulescens</i>	y			
Snowy egret	<i>Egretta thula</i>	y	y		
Snowy plover	<i>Charadrius alexandrinus</i>	y	y	y	
Sora	<i>Porzana carolina</i>	y	y		
Solitary sandpiper	<i>Tringa solitaria</i>	y	y		
Solitary vireo	<i>Vireo solitarius</i>	y	y		
Song sparrow	<i>Melospiza melodia</i>	y	y		
Spotted sandpiper	<i>Actitis macularia</i>	y	y		
Spotted towhee	<i>Pipilo maculatus</i>		y		
Steller's jay	<i>Cyanocitta stelleri</i>	y	y		
Stilt sandpiper	<i>Calidris himantopus</i>	y	y		
Swainson's hawk	<i>Buteo swainsoni</i>	y	y		y
Swainson's thrush	<i>Catharus ustulatus</i>		y		
Swamp sparrow	<i>Melospiza georgiana</i>		y		
Tennessee warbler	<i>Vermivora peregrina</i>		y		
Three-toed woodpecker	<i>Picoides tridactylus</i>	y	y	y	
Townsend's solitaire	<i>Myadestes townsendii</i>	y	y		
Townsend's warbler	<i>Dendroica townsendii</i>		y		
Tree swallow	<i>Tachycineta bicolor</i>	y	y		
Trumpeter swan	<i>Cygnus buccinator</i>	y			
Tundra swan	<i>Cygnus columbianus</i>		y		
Turkey	<i>Meleagris gallopavo</i>	y			
Turkey vulture	<i>Cathartes aura</i>	y	y		y
Veery	<i>Catharus fuscescens</i>	y	y		
Vesper sparrow	<i>Pooecetes gramineus</i>	y	y		y
Violet-green swallow	<i>Tachycineta thalassina</i>	y	y		y
Virginia's warbler	<i>Vermivora virginiae</i>	y	y		
Warbling vireo	<i>Vireo gilvus</i>	y	y		
Western grebe	<i>Aechmophorus occidentalis</i>	y	y		
Western kingbird	<i>Tyrannus verticalis</i>	y	y		
Western meadowlark	<i>Sturnella neglecta</i>	y	y		y
Western sandpiper	<i>Calidris mauri</i>	y	y		
Western scrub-jay	<i>Apheloma californica</i>		y	y	
Western tanager	<i>Piranga ludoviciana</i>	y	y		
Western wood-peewee	<i>Cantopus sordidulus</i>	y	y		
White-breasted nuthatch	<i>Sitta carolinensis</i>		y		
White-crowned sparrow	<i>Zonotrichia leucoophrys</i>	y	y		
White-faced ibis	<i>Plegadis chihi</i>	y	y		y
White-throated swift	<i>Aeronautes saxatalis</i>	y	y		
White-winged crossbill	<i>Loxia leucoptera</i>		y		
Willet	<i>Catotrophorus semipalmatus</i>	y	y		y
Williamson's sapsucker	<i>Sphyrapicus thyroideus</i>		y	y	

APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Common Name	Scientific Name	Data Sources*			
		WOS	ATLAS	WYNDD	HWA
Willow flycatcher	<i>Empidonax traillii</i>		y		
Wilson's phalarope	<i>Phalaropus tricolor</i>	y	y	y	y
Wilson's warbler	<i>Wilsonia pusilla</i>	y	y		
Wood duck	<i>Aix sponsa</i>		y		
Yellow warbler	<i>Dendroica petechia</i>	y	y		
Yellow-breasted chat	<i>Icteria virens</i>	y	y		
Yellow-headed blackbird	<i>Xanthocephalus xanthocephalus</i>	y	y		y
Yellow-rumped warbler	<i>Dendroica coronata</i>	y	y		
AMPHIBIANS					
Boreal chorus frog	<i>Pseudacris triseriata maculata</i>	y	y		
Boreal toad	<i>Bufo boreas boreas</i>		y		
Great Basin spadefoot toad	<i>Scaphiopus intermontanus</i>		y		
Northern leopard frog	<i>Rana pipiens</i>		y	y	
Plains spadefoot toad	<i>Scaphiopus bombifrons</i>	y			
Tiger salamander	<i>Ambystoma tigrinum</i>	y	y		
REPTILES					
Eastern short horned lizard	<i>Phrynosoma douglassi brevirostre</i>	y	y		y
Great Basin gopher snake	<i>Pituophis melanoleucas deserticola</i>				y
Many-lined skink	<i>Eumeces multivirgatus</i>		y	y	
Northern sagebrush lizard	<i>Sceloporus graciosus graciosus</i>		y		y
Ornate box turtle	<i>Terrapene ornata ornata</i>		y		
Prairie lined racer	<i>Cnemidophorus sexlineatus viridis</i>	y			
Pale milk snake	<i>Lampropeltis triangulum multistrata</i>		y	y	
Prairie rattlesnake	<i>Crotalus vinidus vinidus</i>	y	y		y
Wandering garter snake	<i>Thamnophis elegans vagrans</i>	y	y		
Western plains garter snake	<i>Thamnophis radix haydeni</i>		y		
Western smooth green snake	<i>Opheodrys vernalis blanchardi</i>	y	y	y	

*Data Sources

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APPENDIX D. WILDLIFE AND FISH SPECIES LISTS

Table D-2. Fish Species Observed within the ARPA or that May Potentially Occur Downstream of the Atlantic Rim Project Area.

Data Sources²

Common Name	Scientific Name	Game or Non game	Basin ¹	Present in ARPA	Native to ARPA	WYNDD	FOW	BLM	MCBMP	WSAM
Bigmouth shiner	<i>Notropis dorsalis</i>	Non Game	NP				x			
Black bullhead	<i>Ameiurus melas</i>	Game	NP				x			
Black crappie	<i>Pomoxis maculatus</i>	Game	NP				x			
Bluegill	<i>Lepomis macrochirus</i>	Game	NP				x			
Bluehead sucker	<i>Catostomus discobolus</i>	Non Game	LSR	Yes	Yes	x	x	x	x	x
Bonneville cutthroat trout	<i>Oncorhynchus clarki utah</i>	Game	NP				x			
Bonytail	<i>Gila elegans</i>	Non Game	CR							
Brassy minnow	<i>Hybognathus hankinsoni</i>	Non Game	NP				x			
Brook trout	<i>Salvelinus fontinalis</i>	Game	NP, LSR, GDB	Yes			x	x	x	x
Brown trout	<i>Salmo trutta</i>	Game	NP, LSR				x			
Central stoneroller	<i>Campostoma anomalum</i>	Non Game	NP				x			
Channel catfish	<i>Ictalurus punctatus</i>	Game	NP, LSR				x			
Colorado pikeminnow	<i>Ptychocheilus lucius</i>	Non Game	LSR, CR				x	x		
Colorado River cutthroat trout	<i>pleuriticus</i>	Game	NP, LSR	Yes	Yes	x	x	x	x	x
Common carp	<i>Cyprinus carpio</i>	Game	NP, LSR, GDB				x	x		
Common shiner	<i>Luxilus cornutus</i>	Non Game	NP				x			
Creek chub	<i>Semotilus atromaculatus</i>	Non Game	NP, LSR	Yes			x	x	x	x
Emerald shiner	<i>Notropis atherinoides</i>	Non Game	NP				x			
Fathead minnow	<i>Pimephales promelas</i>	Non Game	NP				x	x		
Flannelmouth sucker	<i>Catostomus latipinnis</i>	Non Game	LSR	Yes	Yes	x	x	x	x	x
Fathead chub	<i>Platygobio gracilis</i>	Non Game	NP				x			
Freshwater drum	<i>Aplodinotus grunniens</i>	Non Game	NP				x			
Gizzard Shad	<i>Dorosoma cepedianum</i>	Non Game	NP				x			
Golden shiner	<i>Notemigonus crysoleucas</i>	Non Game	NP				x			
Golden trout	<i>Oncorhynchus aguabonita</i>	Game	NP				x			
Grass carp	<i>Ctenopharygodon idella</i>	Non Game	NP				x			
Grayling	<i>Thymallus arcticus</i>	Game	NP				x			
Green sunfish	<i>Lepomis cyanellus</i>	Game	NP			x	x			
Hornyhead chub	<i>Nocomis biguttatus</i>	Non Game	NP			x	x			
Humpback chub	<i>Gila cypha</i>	Non Game	CR							
Iowa darter	<i>Etheostoma exile</i>	Non Game	NP, LSR				x	x	x	x
Johnny darter	<i>Etheostoma nigrum</i>	Non Game	NP				x			
Kokanee	<i>Oncorhynchus nerka</i>	Game	NP				x			
Lake chub	<i>Couesius plumbeus</i>	Non Game	NP				x			
Lake trout	<i>Salvelinus namaycush</i>	Game	NP				x			
Largemouth bass	<i>Micropterus salmoides</i>	Game	NP				x			
Longnose dace	<i>Rhinichthys cataractae</i>	Non Game	NP, LSR	Yes			x		x	x
Longnose sucker	<i>Catostomus catostomus</i>	Non Game	NP, LSR				x			
Mottled sculpin	<i>Cottus bairdi</i>	Non Game	LSR	Yes	Yes		x	x	x	x
Mountain sucker	<i>Catostomus platyrhynchus</i>	Non Game	LSR	Yes	Yes		x	x	x	x
Mountain whitefish	<i>Prosopium williamsoni</i>	Game	LSR				x		x	x
Northern Pike	<i>Esox lucius</i>	Game	LSR							
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	Game	PR						x	
Plains killifish	<i>Fundulus zebrinus</i>	Non Game	NP				x			
Plains topminnow	<i>Fundulus sciadicus</i>	Non Game	NP				x			
Pumpkin-seed	<i>Lepomis gibbosus</i>	Game	NP				x			
Quillback	<i>Cariodes cyprinus</i>	Non Game	NP				x			
Rainbow trout	<i>Oncorhynchus mykiss</i>	Game	NP, LSR, GDB	Yes			x		x	x
Razorback sucker	<i>Xyrauchen texanus</i>	Non Game	CR							
Red shiner	<i>Cyprinella lutrensis</i>	Non Game	NP				x			
Redside shiner	<i>Richardsonius balteatus</i>	Non Game	LSR	Yes			x	x	x	x
River carsucker	<i>Cariodes carpio</i>	Non Game	NP				x			
Roundtail chub	<i>Gila robusta</i>	Non Game	LSR	Yes	Yes	x	x	x	x	x
Sand shiner	<i>Notropis stramineus</i>	Non Game	NP				x			
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>	Non Game	NP				x			
Smallmouth bass	<i>Micropterus dolomieu</i>	Game	NP				x			
Snake River cutthroat trout	<i>Oncorhynchus clarki ssp.</i>	Game	NP				x			
Speckled dace	<i>Rhinichthys osculus</i>	Non Game	LSR	Yes	Yes		x	x	x	x
Splake	<i>Brook-Lake Trout Hybrid</i>	Game	NP				x			
Walleye	<i>Stizostedion vitreum</i>	Game	NP, LSR							x
White crappie	<i>Pomoxis annularis</i>	Game	NP				x	x		
White sucker	<i>Catostomus commersoni</i>	Non Game	NP, LSR	Yes			x	x		
Yellow perch	<i>Perca flavescens</i>	Game	NP				x			
Yellowstone cutthroat trout	<i>Oncorhynchus clarki bouvieri</i>	Game	LSR				y			

Notes:

1 Basins

CR - These species are downstream residents of the Colorado River Basin
 GDB - Great Divide Basin
 LSR - Little Snake River Basin
 NP - North Platte River Basin
 PR - These species are downstream residents of the Platte River Basin

2 Data Sources

BLM - Bureau of Land Management (See reference USDI-BLM 2001)
 FOW - Fishes of Wyoming (See reference Baxter and Stone 1995)
 MCBMP - Muddy Creek Basin Management Plan (See reference WGFD 1998)
 WSAM - Warm water Stream Assessment Manual (See reference WGFD 2004)
 WYNDD - Wyoming Natural Diversity Database (See reference WYNDD 2003)

Appendix E

Wildlife Monitoring and Protection Plan

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 Rawlins Field Office
 Rawlins, Wyoming

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1 Introduction

This wildlife monitoring/protection plan was prepared in conjunction with the Environmental Impact Statement (EIS) for the Atlantic Rim Project Area (ARPA). The goal of the plan is to avoid and/or minimize adverse impacts to wildlife present on project-affected areas by monitoring wildlife population trends on the ARNG during the course of project development and operations and by developing appropriate mitigation actions. Implementation of the plan will allow land managers and project personnel opportunities to achieve and maintain desired levels of wildlife productivity and populations on the ARNG (e.g., at pre-project levels) by minimizing and/or avoiding potential adverse impacts to wildlife species. In addition, the implementation of this plan will facilitate the maintenance of a diverse assemblage of wildlife populations on the ARNG simultaneously with development of natural gas reserves.

Proposed inventory, monitoring, and protection measures will be implemented under each potential development scenario. Implementation of the plan will begin in 2006, and is estimated to continue for the life of the EIS. At the completion of the drilling phase, the plan will be reviewed by a Review Team. If evidence exists that wildlife populations and habitat have been successfully protected, the Review Team may make a recommendation to terminate the plan at that time. The plan will receive a major review for effectiveness every 5 to 6 years or as determined by the Review Team.

2 Implementation Protocol

This section provides preliminary wildlife inventory, monitoring, and protection protocol. A summary of primary protocol components is provided in table E-1. Standard protocol for Application for Permit to Drill (APD) and right-of-way (ROW) application field reviews are provided in table E-2. Alternative protocols likely will be developed in the future in response to specific needs identified in annual reports (section 2.1.1). Methods are provided for each wildlife species/category, and additional species/categories may be added based on needs identified in annual reports. The wildlife species/categories for which specific inventory, monitoring, and protection procedures will be applied were developed based on management agency (Bureau of Land Management [BLM], U.S. Fish and Wildlife Service [USFWS], Wyoming Game and Fish Department [WGFD]) and individual concerns identified during the preparation of the EIS.

Considerable efforts will be required by agency and operator personnel for plan implementation. Many of the annually proposed agency data collection activities are consistent with current agency requirements. Additionally, during annual planning (section 2.1.2) and throughout project implementation, all efforts will be made to accommodate agency personnel schedules and responsibilities, and further agency cost-sharing approaches will be considered such that public demands and statutory directives are achieved.

2.1 Annual Reports and Meetings

2.1.1 Reports

During project development, operators will provide an updated inventory and description of all existing project features (i.e., location, size, and associated level of human activity at each feature), as well as those tentatively proposed for development during the next 12 months in a format that is compatible with a Geographic Information System (GIS). This inventory will be

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submitted to the BLM by operators no later than October 15 of each calendar year. These data will be coupled with annual wildlife inventory, monitoring, and protection data obtained for the previous year and included in annual reports. Annual reports will be prepared by the operators' third party contractor with BLM oversight. Annual wildlife inventory, monitoring and protection data gathered in conjunction with the project will be provided to the BLM by October 15 of each calendar year.

Annual reports will summarize annual wildlife inventory and monitoring results, note any trends across years, identify and assess protection measures implemented during past years, specify monitoring and protection measures proposed for the upcoming year, recommend modifications to the existing wildlife monitoring/protection plan based on the successes and/or failures of past years and identify additional species/categories to be monitored. Where possible, the data presented in reports will be used to identify potential correlations between development and wildlife productivity and/or abundance, as well as, sources of potential disturbance to wildlife. A GIS will be used for information storage, retrieval, planning, and annual GIS data updates will be conducted. Raw data collected each year also will be provided to other management agencies, at the request of the agencies.

Annual reports will be completed in draft and submitted to the BLM, operators and other interested parties by November 15 of each year. A final annual report will be issued to all potentially affected individuals and groups by early February of each year. Additional reports may be prepared in any year, as necessary, to comply with other relevant wildlife laws, rules, and regulations.

2.1.2 Meetings

A one day meeting will be organized by the BLM and held in December (or as determined by the Review Team) of each year to discuss and modify, as necessary, proposed wildlife inventory, monitoring and protection protocol for the subsequent year. Decisions regarding annual operator-specific financing and personnel requirements will be made at these meetings. A protocol regarding how to accommodate previously unidentified development sites will also be determined during the annual meeting. Final decisions will be made by the BLM based on the input of all affected parties.

Additional meetings may be held in any given year to inform and update cooperators on the findings of additional reports, as necessary.

2.2 Annual Inventory and Monitoring

Inventory and monitoring protocols will be as identified below for each wildlife species/category. These protocols will be unchanged across development alternatives, except as authorized by the BLM or specified in this plan. Additional wildlife species/categories and associated surveys may be added or wildlife species/categories and surveys may be omitted in future years, pending results presented in the coordinated review of annual reports. Opportunistic wildlife observations may be made throughout the year by agency and operator personnel present in the project area.

The frequency of inventory and monitoring will be dependent upon the level of development in the project area. In general, inventory and monitoring frequency will increase with increased levels of development. Inventory and monitoring results may lead to further, currently unidentifiable, scientific studies specifically designed to determine cause and effect. The

Review Team and/or BLM will identify the level of effort required by this wildlife plan subject to the standard listed below. Site- and species-specific surveys will be conducted in association with APD and ROW application field reviews.

2.2.1 Threatened, Endangered, Candidate, and Other Species of Concern

The level of inventory/monitoring required for threatened, endangered, candidate, and other species of concern (TEC&SC) will be commensurate with established protocols for the potentially affected species. All surveys will be conducted in coordination with the BLM. Methodologies and results of these surveys will be included in annual reports and provided in separate supplemental reports. A preliminary list of TEC&SC species proposed for management and known from or potentially occurring in the vicinity of the project area is shown in chapter 3. As TEC&SC species are added to or withdrawn from USFWS, BLM, and/or WGFD lists, appropriate modifications will be incorporated to this plan and specified in annual reports.

TEC&SC data collected during surveys and described below will be provided only as necessary to those requiring the data for specific management and/or project development needs. Site- and species-specific TEC&SC surveys will be conducted as necessary in association with all APD and ROW application field reviews.

2.2.1.1 Black-footed Ferret

The USFWS, in coordination with the WGFD, has developed a list of habitat blocks that are not likely to be inhabited by black-footed ferrets (block cleared). In these areas, take of individual ferrets and effects to a wild population are not an issue and surveys for ferrets are no longer recommended. Although ferret surveys are not required in these areas, the area may still maintain value for the survival and recovery of the species in the future. Additionally, areas remain that require ferret surveys (non-block cleared) in potential habitat. A portion of the project area coincides with the Dad complex, which is a non-block cleared area, requiring ferret surveys in areas that would likely result in the take of a ferret during project implementation.

BLM biologists will determine the presence/absence of prairie dog colonies at each proposed development site during APD and ROW application field reviews. Prairie dog colonies in the project area will be mapped and burrow densities determined by a BLM-approved operator-financed biologist, as necessary and in association with proposed development plans. Colonies that meet USFWS criteria as potential black-footed ferret habitat (USFWS 1989), in non-block cleared areas, will be surveyed for black-footed ferrets by an USFWS-certified operator-financed surveyor prior to BLM authorizing disturbance of these colonies. Surveys will be conducted as deemed necessary, during consultation with the BLM and/or USFWS. Black-footed ferret surveys will be conducted in accordance with USFWS guidelines (USFWS 1989) and approved by BLM and USFWS.

2.2.1.2 Bald Eagle, Peregrine Falcon, and Ferruginous Hawk

Inventory and monitoring protocol for bald eagle, peregrine falcon, and ferruginous hawk will be as described for raptors (section 2.2.1).

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2.2.1.3 Greater Sage-Grouse & Columbian Sharp-Tailed Grouse

Greater sage-grouse/Columbian sharp-tailed grouse lek inventories will be conducted by the BLM and WGFD on the project area and a two mile/one mile buffer to determine lek locations every 5 years, or as deemed appropriate by the BLM. Surveys may be conducted aerially, with operator-provided financial assistance for aircraft rental, or on the ground, in order to determine lek locations.

Selected leks within two miles/one mile of existing and proposed disturbance areas will be monitored annually to determine lek attendance by the BLM or a BLM-approved operator-financed biologist, between March 1 and May 15, such that all leks on these areas are monitored at least once every 3 years. Monitoring efforts will be implemented at all leks present on affected sections, two mile buffers, and selected undeveloped comparison areas. The BLM will direct lek monitoring efforts such that efforts are made to have the same individuals monitor the same leks within and across years. Data collected during these surveys will be provided on a standardized form. Standard site- and species-specific grouse lek surveys will be conducted as necessary in association with all APD and ROW application field reviews.

2.2.1.4 Mountain Plover

Mountain plover breeding habitat includes short-grass prairie and shrub-steppe landscapes, dryland, cultivated farms, and prairie dog towns. Plovers usually nest on sites where vegetation is sparse or absent, conditions that can be created by herbivores, including domestic livestock and prairie dogs. Vegetation in shortgrass prairie sites is typically less than 4 inches tall. Nest sites within the shrub-steppe landscape are also confined to areas with little to no vegetation, although surrounded by areas visually dominated by shrubs. Commonly, nest sites within shrub-steppe areas are on active prairie dog towns. Nests are commonly located near a manure pile or rock. In addition to areas disturbed by prairie dogs or livestock, nests have also been found on bare ground created by oil and gas development activities and on dryland, cultivated agriculture in the southern part of their breeding range. Mountain plovers are rarely found near water. Positive indicators for mountain plovers therefore include level terrain, prairie dogs, bare ground, Opuntia pads, cattle widely spaced plants, and horned larks. It would be unusual to find mountain plovers on sites characterized by irregular or rolling terrain, dense, matted vegetation, grass taller than 4 inches, wet soils, or the presence of killdeer.

Mountain plover habitat will be mapped within proposed disturbance areas (as identified in annual reports) prior to development of these areas by the BLM or a BLM-approved operator-financed biologist. In addition, these areas will be surveyed annually by the BLM or a BLM-approved operator-financed biologist to detect the presence of plovers. Surveys will be conducted during the period of May 1 through June 30. Data collected during these surveys will be provided on mountain plover route survey forms. Standard site-specific habitat surveys will be conducted as necessary in association with all APD and ROW application field reviews.

2.2.1.5 Western Burrowing Owl

Prairie dog colonies and other suitable burrowing owl nesting areas on and within 0.75 miles of existing and proposed disturbance areas will be searched for western burrowing owls by the BLM or a during June through August to determine the presence or absence of nesting owls. If burrowing owls are found, attempts will be made to determine reproductive success. Standard site-specific surveys will be conducted in association with all APD and ROW application field reviews.

2.2.1.6 Other TEC&SC Species

Surveys for other TEC&SC species will be conducted by the BLM or a BLM-approved operator-financed biologist in areas of potential habitat within one-half mile of proposed disturbance sites prior to disturbance. These surveys may be implemented in conjunction with surveys for other species or as components of APD and/or ROW application processes. If any TEC&SC species are observed, the observations will be noted on appropriate data forms and efforts will be made to determine their activities (e.g., breeding, nesting, foraging, hunting, etc.). If any management agency identifies a potential for concern regarding any of these species, additional inventory and monitoring and mitigation may be implemented as specified in annual reports.

2.2.2 Raptors

Raptor inventories will be conducted by the BLM, at least every five years or prior to development of proposed disturbance areas (as identified in annual reports), to determine the location of raptor nests. Raptor nest monitoring will be conducted by the BLM or a BLM approved operator-financed biologist, annually, at known nest locations, between April and July, in order to ascertain nest activity status. These surveys may be implemented aerially, via helicopter, or from the ground. Operators may provide financial assistance for aircraft rental.

Nest productivity monitoring will be conducted by the BLM at active nests, for selected species, to determine nesting success. Monitoring generally will be conducted from the ground, and attempts will be made to determine the cause of any documented nest failure. Operators may provide financial assistance for aircraft rental, as necessary. Site- and species-specific raptor nest inventories will be conducted as necessary in association with all APD and ROW application field reviews.

All raptor nest/productivity surveys will be conducted using procedures that minimize potential adverse effects to nesting raptors. Specific survey measures for reducing detrimental effects are listed in Grier and Fyfe (1987) and Call (1978) and include the following.

- Nest visits will be delayed for as long as possible in the nesting season.
- Nests will be approached cautiously, and their status (i.e., number of nestlings/fledglings) will be determined from a distance with binoculars or a spotting scope.
- Nests will be approached tangentially and in an obvious manner to avoid startling adults.
- Nests will not be visited during adverse weather conditions (e.g., extreme cold, precipitation events, windy periods, and hottest part of the day).
- Visits will be kept as brief as possible.
- All inventories will be coordinated by the BLM.
- The number of nest visits in any year will be kept to a minimum.
- All raptor nest location data will be considered confidential.

2.2.3 Big Game Crucial Winter Range

Data on big game use of crucial winter ranges on the project area and an adjacent one mile buffer will be requested annually by the BLM from the WGFD, as deemed necessary by the BLM. This information will be used to assess the effectiveness of protection measures implemented for the project. In the event that BLM, in consultation with WGFD and other interested parties, determines that additional data should be collected for big game, these issues will be discussed at the annual meeting (See section 2.1.2, Meetings) and monitoring plans modified as agreed to by the parties.

2.2.4 Other Inventory and Monitoring Measures

Additional inventory and monitoring measures may be applied for other species as specified in annual reports. Surveys will be conducted in adherence with protocol to be established by the BLM, other agencies and operators. Operators may provide financial assistance for these investigations.

2.2.5 General Wildlife

BLM staff will be responsible for maintaining records of selected wildlife species observed during the course of their activities on the project area. Operator personnel may also provide data on wildlife observations. The information provided will include observations of wildlife species, their numbers, location, activity, and other pertinent data as applicable and identified on the General Wildlife Observation Data Sheet. Where operators are uncertain of the United States Geological Survey (USGS) coordinates for an observation, a general description of the location may be provided and in instances where species or sex information is questionable, operators will identify the observation as such.

2.3 Protection Measures

The wildlife protection measures proposed herein have been developed from past measures identified for oil and gas developments in Wyoming. Additional measures may be included and/or existing measures may be modified in any given year as allowable and as deemed appropriate by BLM in consultation with other agencies, operators and interested parties. These measures will be specified in annual reports. Protection measures will be implemented by operators with assistance from and/or in consultation with the BLM. In addition, these measures may be modified on a site-specific basis as deemed appropriate by the BLM after completion of APD and ROW application field reviews.

The principal protection measure for most wildlife will be species- and project-specific measures as well as general wildlife protection measures (section 2.3.4). Implementation of these measures may benefit other wildlife species found on and adjacent to the project area. Sensitive/crucial habitats should be avoided where possible.

2.3.1 TEC&SC

USFWS and WGFD consultation and coordination will be conducted for all protection activities relating to TEC&SC species and their habitats. Where possible, these actions will be specified in advance in the annual reports.

2.3.1.1 Black-footed Ferret

In general, all prairie dog colonies on the project area will be avoided, where practical. If prairie dog colonies, in non-block cleared areas, of sufficient size and burrow density for black-footed ferrets are scheduled to be disturbed, black-footed ferret surveys of these colonies will be conducted pursuant to BLM and/or USFWS decisions made during informal consultations. Survey protocol will adhere to USFWS guidelines as established in USFWS (1989) and will be conducted by a USFWS-qualified biologist a maximum of one year in advance of the proposed disturbance. Reports identifying survey methods and results will be prepared and submitted to the USFWS and BLM in accordance with section 7 of the *Endangered Species Act of 1973*, as amended, and the Interagency Cooperation Regulations. Surveys will be financed by the operators.

If black-footed ferrets are found on the project area, the USFWS will be notified immediately and formal consultations will be initiated to develop strategies that ensure no adverse effects to the species. Before ground-disturbing activities are initiated in black-footed ferret habitat, authorizations to proceed must be received from the BLM, in consultation with the USFWS.

2.3.1.2 Bald Eagle, Peregrine Falcon, and Ferruginous Hawk

Protection protocol will be as described for raptors (See section 2.3.1). Additional measures will be applied on a species- or site-specific basis, as deemed appropriate by the BLM and/or USFWS, and specified in annual reports.

2.3.1.3 Greater Sage-Grouse & Columbian Sharp-Tailed Grouse

Surface disturbance or occupancy will be prohibited within one-quarter mile of the perimeter of occupied leks; Human activity would be avoided between 6:00 p.m. and 9:00 a.m. from March 1 to May 20 within one-quarter mile of the perimeter of occupied leks; Surface disturbance and other actions that create permanent and high-profile structures such as buildings, storage tanks and overhead power lines, will not be constructed within 0.25 to 1.0 mile of the perimeter of leks, as determined on a case-by-case basis; Surface disturbing and disruptive activities will not be allowed within two miles of an occupied greater sage-grouse lek or in nesting and early brood-rearing habitat associated with individual leks (when identified and delineated), from March 1 to July 15; Surface disturbing and disruptive activities will not be allowed within one mile of an occupied Columbian sharp-tailed grouse lek or in nesting and early brood-rearing habitat associated with individual leks (when identified and delineated), from March 1 to July 15; Surface disturbing and disruptive activities will not be allowed between November 15 and March 14 in delineated winter concentration areas; and, in order to minimize noise disturbances to strutting or dancing grouse, compressor stations and generators will be muffled with hospital style mufflers. Other techniques and/or equipment can be utilized, when it is demonstrated that they result in similar or increased noise reduction. Additional noise reduction techniques may be required if research shows that current techniques are not adequate.

2.3.1.4 Mountain Plover

Mountain plover habitat will be avoided where practical due to the presence of alternative well and road development sites. Where these habitats will be disturbed, reclamation will utilize procedures designed to reestablish suitable plover habitat. The primary protection measure for mountain plover on the project area will be avoidance plover habitat during the breeding season. All surface-disturbing activities will be restricted from April 10 to July 10 in mountain

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plover habitat. Additional protection measures, as shown below, may be implemented in identified mountain plover occupied habitat (i.e., areas where broods and/or adults have been observed in the current year or documented in at least 2 of the past 3 years). Surface disturbance would occur outside identified occupied habitat for mountain plovers where feasible.

- Within one-half mile of the identified mountain plover occupied habitat area; speed limits would be posted at 25 miles per hour (mph) on resource roads and 35 mph on local roads during the brood rearing period (June 1–July 10).
- The access road would be realigned to avoid the identified mountain plover occupied habitat area.
- To protect mountain plover in occupied habitat, traffic would be minimized from June 1–July 10 by car-pooling and organizing work activities to minimize trips on roads through the mountain plover occupied habitat area.
- To protect mountain plover in occupied habitat, fences, storage tanks, and other elevated structures would be either constructed as low as possible and/or would incorporate perch-inhibitors into their design.
- To minimize destruction of nests and disturbance to breeding mountain plovers, no ground-disturbing activities would occur from April 10–July 10 unless surveys consistent with the Plover Guidelines or other FWS approved method find that no plovers are nesting in the area.
- A plugged and abandoned well within one-half mile of the identified mountain plover occupied habitat area would be identified with a marker 4 feet tall with a perch inhibitor on the top of the marker.

2.3.1.5 Western Burrowing Owl

Protection protocol will be as described for raptors (section 2.3.1) as well as avoidance of prairie dog colonies, where practical (section 2.3.2.1).

2.3.1.6 Other TEC&SC Species

If crucial features for any TEC&SC species are found during surveys of areas within one-half mile of proposed disturbance sites, avoidance of these features will be accomplished in consultation and coordination with the BLM, USFWS, and WGFD. Construction activities in these areas will be curtailed until there is concurrence between BLM, USFWS, and WGFD on what activities can be authorized. Activities will, in most cases, be delayed until such time that no adverse effects will occur.

It is assumed that the protocol specified in section 2.3.4 for general wildlife will likely benefit TEC&SC species as well. If any management agency identifies a potential for impacts to any TEC&SC species, additional measures may be implemented as specified in annual reports.

2.3.2 Raptors

The primary protection measure for raptor species on the project area will be avoidance of nest locations during the breeding season. All surface-disturbing activities will be restricted from

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February 1 through July 31 within a 0.75 to 1.0 mile radius of raptor nests, depending upon species. In addition, well locations, roads, ancillary facilities, and other surface structures requiring a repeated human presence will not be constructed within 825 feet of raptor nests, except ferruginous hawk, where the restriction will be 1,200 feet (restrictions will generally exclude surface disturbance).

Operators will notify the BLM immediately if raptors are found nesting on or within 1,200 feet of project facilities, and operators will assist the BLM as necessary in erecting artificial nesting structures (ANSs), as appropriate. The use of ANSs will be considered as a last resort for raptor protection. If nest manipulation or a situation requiring a "taking" of a raptor nest becomes necessary, a special permit will be obtained from the Denver USFWS Office, Permit Section, and will be initiated with sufficient lead time to allow for development of mitigation. Required corresponding permits will be obtained from the WGFD in Cheyenne. Consultation and coordination with the USFWS and WGFD will be conducted for all protection activities relating to raptors.

If it is found that project activities could potentially affect raptor nesting on or adjacent to the project area, as determined from decreased raptor productivity or nesting, or documented nest abandonment or failure, ANSs may be constructed at a rate of up to two ANSs for one impacted nest. Existing degraded raptor nests may be upgraded or reinforced to minimize potential impacts. ANSs will be located within the nesting territory of potentially affected raptor pairs, outside of the line-of-sight or nest buffer of actively nesting pairs, where possible. Operators will be responsible for the annual maintenance of ANSs throughout the life-of-project (LOP). Annual ANS maintenance activities will be completed after August 15 and prior to October 15 each year, as necessary. All ANSs on public lands will become the property of the BLM upon completion of the project. Pertinent data regarding ANSs or nests proposed for upgrading will be identified in annual reports.

In cases where existing project features are located within the nest buffers of active raptor nests, no prolonged maintenance activities will be allowed during critical periods. The exact dates of exclusion will be determined by the BLM and will likely vary between nests and from year to year, depending on the species present and variations in weather, nesting chronology, and other factors.

Any power line construction will follow the recommendations of the Avian Power Line Interaction Committee (APLIC) (1994, 1996) and Olendorff et al. (1981) to avoid collisions and/or electrocution of raptors.

2.3.3 Big Game Species

No construction activities or prolonged maintenance actions will be conducted within big game crucial winter range during the crucial winter periods of November 15–April 30. If right-of-way fencing is required, it will be kept to a minimum, and the fences will meet BLM/WGFD approval for facilitating wildlife movement. Wildlife-proof fencing will be used only to enclose areas that are potentially hazardous to wildlife species, or reclaimed areas where it is determined that wildlife species are impeding successful vegetation establishment. Snow fences, if used, will be limited to segments of one-quarter mile or less. Project personnel will also be advised to minimize stopping and exiting their vehicles in big game winter habitat during crucial winter periods. In addition, escape openings will be provided along roads in big game crucial winter ranges, as designated by the BLM, to facilitate exit of big game animals from snowplowed roads. The use of gates on roads within development areas would also preclude or limit

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motorized public access in sensitive wildlife areas. Additional habitat protection/improvement measures may also be applied in any given year as directed by the BLM, in consultation with operators and other agencies, and specified in annual reports.

2.3.4 General Wildlife

Unless otherwise indicated, the following protection measures will be applied for all wildlife species. Additional measures primarily designed to minimize impacts to other resources (e.g., vegetation and surface water resources, including wetlands, steep slopes, etc.) are identified in the EIS in chapter 4, and these measures may provide additional protection for wildlife. Additional actions may be applied in any given year to further minimize potential impacts to wildlife. These actions will be specified in annual reports.

All roads on and adjacent to the project area that are required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions and facilitate wildlife (most notably big game) movement through the project area. Appropriate speed limits will be adhered to on all project roads, and operators will advise employees and contractors regarding these speed limits. Some existing roads on the project area and surrounding transportation planning area may be reclaimed if they become redundant, or closed (gated and locked, year-round or seasonally) to deny unnecessary access.

To protect important habitat in portions of the project area (i.e., ephemeral draws dominated by basin big sagebrush) areas with sagebrush greater than three feet tall will be avoided where possible.

Additional non-species-specific wildlife mitigations include the following.

- Reserve, work-over, and flare pits and other locations potentially hazardous to wildlife will be adequately protected by netting and/or fencing as directed by the BLM to prohibit wildlife access.
- If dead or injured raptors, big game, migratory birds, or unusual wildlife are observed on the project area, operator personnel will contact the appropriate BLM and WGFD offices. Under no circumstances will dead or injured wildlife be approached or handled by operator personnel.
- Employee and contractor education will be conducted regarding wildlife laws. If violations are discovered on the project area, operators will immediately notify the appropriate agency. If the violation is committed by an employee or contractor, said employee or contractor will be disciplined and may be dismissed by the operator and/or prosecuted by the WGFD and/or USFWS.
- Operators will implement policies designed to control off-site activities of operational personnel and littering, and will notify all employees (contract and company) that conviction of a violation can result in disciplinary action, including dismissal.

Additional project- and site-specific mitigation measures may be added in future years, as specified in annual reports.

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APPENDIX E. WILDLIFE MONITORING AND PROTECTION PLAN

Table E-1. Summary of General Wildlife Reporting, Inventory, and Monitoring.

ACTION	DATES	RESPONSIBLE ENTITY
Annual tentative plan of development	By October 15, annually	Operator
Annual inventory, monitoring and protection data	By October 15, annually	
Annual reports	Annually: Draft—early November Final—early January	Operator
Annual meeting	December and as necessary	BLM with participation by other agencies and operators
INVENTORY/MONITORING		
Raptor nest inventory	At least every five years, prior to development	BLM or BLM approved operator financed biologist with operator provided financial assistance for aircraft rental, as necessary
Raptor monitoring	Annually from April to July	BLM or BLM approved operator financed biologist with operator provided financial assistance for aircraft rental, as necessary
Greater sage-grouse & Columbian sharp-tailed grouse lek inventory	At least every five years	BLM or BLM approved operator financed biologist with operator provided financial assistance for aircraft rental, as necessary
Greater sage-grouse & Columbian sharp-tailed grouse lek monitoring	Annually from March to mid-May	BLM or BLM approved operator financed biologist
Big game crucial winter range use/monitoring	As available	BLM will request data from WGFD
Mountain Plover surveys	Annually from May to June	BLM or BLM approved operator financed biologist

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Table E-2. Summary of General APD/ROW Application Stage Survey/Protection Measures.

PROTECTION MEASURE	DATES	RESPONSIBLE ENTITY
Raptor nest survey/inventory within 0.75 to 1.0 miles of proposed disturbance	Yearlong	BLM, operator
Raptor nest season avoidance within 0.75 to 1.0 miles	February 1 to July 31	BLM, operator
Raptor nest avoidance with 825 feet (1200 feet for ferruginous hawk nests)	Yearlong	BLM, operator
TEC&SC surveys	Yearlong, as necessary	BLM, operator
TEC&SC avoidance	Yearlong, as necessary	BLM, operator
Prairie dog colony mapping	Yearlong, as necessary	BLM, operator
Prairie dog colony avoidance	Yearlong, where practical	BLM, operator
Black-footed ferret surveys	As appropriate in accordance with USFWS guidelines	Operator financed USFWS-approved biologist
Mountain Plover habitat surveys	Yearlong	BLM, operator
Mountain plover nest/brood avoidance	April 10 to July 10	BLM, operator
Greater sage-grouse lek/nesting habitat avoidance within 2.0 miles of proposed disturbance; Columbian sharp-tailed grouse lek/nesting habitat avoidance within 1.0 mile of proposed disturbance	March 1 to July 15	BLM, operator
Greater sage-grouse and Columbian sharp-tailed grouse lek avoidance within 0.25 miles of proposed disturbance	Yearlong	BLM, operator
Big game crucial winter range avoidance	November 15 to April 30	BLM, operator
General wildlife avoidance/protection	As necessary	BLM, other agencies, operator

Note:

TEC&SC - threatened, endangered, candidate, and other species of concern

Appendix F

Air Quality Technical Support Document, Atlantic Rim Natural Gas Project and the Seminoe Road Gas Development Project, Wyoming

Appendix F can be found on the enclosed CD found at the back of this volume.

Appendix G
Biological Assessment

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APPENDIX G

BIOLOGICAL ASSESSMENT

1 Introduction

This Biological Assessment (BA) discusses the potential effects of the proposed Atlantic Rim Project Area (ARPA) on threatened, endangered, and proposed species pursuant to the Endangered Species Act (ESA) of 1973. Candidate species for listing under the ESA are also discussed. This BA also presents recommendations to ensure that the construction and subsequent operation of the proposed project will neither jeopardize the continued existence of those species nor result in the destruction or adverse modification of their critical habitats. Analysis of the effects of this proposed project on threatened, endangered, and proposed species complies with the provisions of the ESA. The Bureau of Land Management (BLM) maintains an interest in protecting candidate species under their sensitive species policy (BLM Manual 6840), with the goal that actions on BLM-administered lands consider the welfare of these species and do not contribute to the need to list any of the sensitive species under the provisions of the ESA.

1.1 Project Area Location

The ARPA is located in the southwestern corner of Wyoming's Carbon County, within Townships 13 through 20 North (T13-20N) and Ranges 89 through 92 West (R89-92W) of the 6th principal meridian. The project area encompasses approximately 270,000 acres. Of this total, approximately 174,000 acres are managed by the U.S. Department of the Interior (USDI) BLM; 14,000 acres are managed by the State of Wyoming; and about 82,000 acres are private lands. A detailed description of the project area location can be found in section 1.1 of the Environmental Impact Statement (EIS) (USDI-BLM 2006).

1.2 Project Description

Anadarko E & P Company, LP (AEPC), along with other operators, proposes to drill approximately 2,000 development wells within the ARPA. While the Atlantic Rim EIS is being prepared, BLM has allowed the interim drilling of about 116 natural gas wells on six plan of development (POD) locations within the ARPA. The objective of the interim drilling program is to enable the ARPA operators to drill, complete, and produce the wells to determine which geologic objectives are gas-productive, which drilling and completion techniques are economical, if dewatering of the drilling objectives can be achieved, and what depths or pressure windows may be preferred to target economic gas production. In addition to those wells drilled under the Atlantic Rim interim drilling program, 210 previously approved wells, with accompanying production-related facilities, also exist within the ARPA.

Four alternatives have been developed for the proposed project: the Proposed Action, Alternative A (no action), Alternative C (spatial), and Alternative D (intensive reclamation). Each alternative and the Proposed Action are described below.

1.2.1 Proposed Action

The operators have submitted a detailed plan of development for the ARPA, which is included in the EIS as appendix K (USDI-BLM 2006). In summary, they propose the following:

- The Proposed Action consists of drilling and developing approximately 2,000 new natural gas wells. Approximately 1,800 would be drilled to coal formations in the Mesaverde Group to develop coal bed natural gas resources. An additional 200 wells would be drilled to access conventional natural gas resources generally expected to be located deeper than the Mesaverde Group.
- The 2,000 proposed, new natural gas wells would be in addition to the approximately 116 ARPA exploration wells (as of the fall of 2005) from the interim drilling period.
- Proposed well spacing is eight wells per section (80-acre spacing) throughout the project area and may be reduced to four wells per section (160-acre spacing) depending on the geology and ability of the operators to release and recover the gas.
- Development and drilling would begin in 2006 within the ARPA and continue for approximately 20 years, with a life-of-project of 30–50 years. Various drilling- and production-related facilities (e.g., roads, pipelines, water wells, disposal wells, compressor stations, and gas processing facilities) would also be constructed throughout the ARPA.
- Under the Proposed Action, there would be approximately 4,500 acres of new short-term (initial, which equals <3 years) surface disturbance from well pads; 1,000 miles (approximately 9,850 acres) of new roads, upgrades of existing roads, and pipeline construction; and 1,480 acres of ancillary facilities. The total new short-term (initial) disturbance resulting from the proposed action would be about 15,800 acres or 7.9 acres per well on average.
- Long-term (i.e., life-of-project) disturbance following interim reclamation includes approximately 2,320 acres for wells pads, 3,636 acres for roads and utilities, and 285 acres for ancillary facilities for a total of 6,241 acres (3.1 acres per well on average). Interim reclamation would reduce the total acres of disturbance by about 9,500 acres.
- Produced water from individual wells would be gathered and routed to centralized water handling and storage sites, which would serve as central injection facilities. Produced water would be disposed of through re-injection, with two exceptions. One exception would be using the closed system as well as limited use for livestock and wildlife watering systems, with appropriate state permits. The second exception would be offsets for current artesian water sources. The operators anticipate that water produced from the 2,000 wells, if being dewatered simultaneously, would need approximately 166 injection wells for disposal.

1.2.2 Alternative A (No Action)

National Energy Policy Act (NEPA) regulations require that EIS alternative analyses “include the alternative of no action” (40 CFR 1502.14(d)). For this analysis, *no action* means that the BLM would reject the operators’ proposal and “the proposed activity would not take place.”

With rejection of the operators’ proposal, subsequent development proposals could be received for access to state and private lands for mineral development. BLM does not approve or control development proposals upon state and private lands. Proposals for access across federal lands for oil and gas development and production-related activities could be received, processed, and as appropriate approved by the BLM at any time. This policy arises from the BLM Manual, Part 2800.06, which states in part that “It is the policy of the BLM to (D) allow owners of non-federal lands surrounded by public lands managed under Federal Land Policy and Management Act (FLPMA) a degree of access across public lands which will provide for the reasonable use and enjoyment of the non-federal land.”

Any such proposals, if they should occur, would be outside the scope of this analysis.

1.2.3 Alternative C

Development for natural gas would occur as in the Proposed Action, but would require the application of development protection measures in those areas with sensitive or crucial resource values (USDI-BLM 2006, appendix L). Alternative C would limit development across up to 95 percent of the project area. In general, constraints would focus on surface disturbance limits; limited operating periods; modification of drilling and construction practices; and, in some cases, no surface occupancy. Since site-specific locations for development are not known, site-specific impacts cannot be assessed at this time. Resource data, in the form of geographic information system (GIS) layers, would be used to identify specific areas of resource concern at the site-specific level. Examples of such resource concerns are sensitive wildlife and fish habitat and areas with sensitive soils. These types of areas are unique enough to require additional protective measures beyond what is already provided by applying required best management practices (USDI-BLM 2006, appendices H and J), lease stipulations, and Conditions of Approval. As an end product, GIS layers would be available to operators for development of site-specific proposals for their annual work program during the Application for Permit to Drill process.

Below is a summary of development protection measures that would be implemented in some locations based on the presence of resources. A detailed description of protection measures is provided in appendix L of the EIS (USDI-BLM 2006), including references to maps (USDI-BLM 2006, appendix M) depicting areas where the measures may be applicable.

- **Water and Soil Management.** No pad, compressor, or water transfer sites would be located in areas with predominately steep slopes or close to perennial waters or wetlands. Interim reclamation would be completed within 1 year of the spud date in areas with soils with excess salts and poor top soils, since these areas are more difficult to reclaim. Low-impact road design would be implemented in areas where soils have excess salts, high runoff potential, and severe road rating to reduce impacts from roads. This action should reduce salt and sediment loading in the Colorado River Basin, a resource management concern since the 1930s. Specifications for road construction and annual maintenance to reduce dust would be implemented in areas with soils with excess salts, and in areas with a severe

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road rating, since these areas would generally have a higher clay or salt content in the soils and hence be more prone to dust problems. Special measures would be implemented in areas with high runoff potential to reduce surface water concentration, increase infiltration, and achieve reclamation success. Areas with high runoff potential would also have reduced surface disturbance (less than 20 acres and four well locations per section).

- **Vegetation Resources.** In vegetation communities difficult to reclaim within the project area with greater than 8-percent slopes, surface disturbance would be limited to less than 20 acres and four well locations per section. In vegetation communities with high wildlife values or rare vegetation communities, no surface disturbance would be allowed (approximately 0.6 percent or 1,500 acres of the ARPA). Silver sagebrush/bitterbrush communities would have limited surface disturbance. All these communities within crucial winter range failed the Upper Colorado River Basin Standards and Guidelines Assessment (USDI-BLM 2002). These areas would continue to fail standards without additional development protection measures.
- **Range Resources.** To protect range resources, operators shall ensure that their employees and subcontractors abide by speed limits and erect signs warning drivers of livestock concentration areas such as lambing grounds and shipping pastures. Annual planning efforts would provide data to allow planning specific to pastures or allotment boundaries to facilitate livestock planning. Construction specifications will be put in place to reduce dust.
- **Wildlife Resource Management.** In grouse brood rearing or nesting habitat and big game crucial winter range, surface disturbance (less than 20 acres and four wells locations per section) and roads would be limited to less than 3 miles/mile², based on programmatic standards recommended by the Wyoming Game and Fish Department (WGFD). No surface disturbance would be allowed in severe winter relief habitats for greater sage-grouse; these areas serve as refuges, that is, small patches of high sagebrush that generally will not drift during severe winters. No surface disturbance would be allowed in identified wintering areas (serviceberry patches) for Columbian sharp-tailed grouse.
- **Visual Resources.** In Visual Resource Management (VRM) Class III areas visible from state, county or BLM roads (USDI-BLM 2006, appendix M, map M-6):
 - Drilling pads would not be located on ridgelines;
 - Resource roads would not be located directly off these public roads, unless it is shown to be visibly less obtrusive than creating a new collector road;
 - Low-impact road design would be used in topography with less than 5-percent slope (See appendix L of the EIS for a description of low-impact road design [USDI-BLM 2006]);
 - Pad sizes would be minimized by using pitless, shared pit, or closed system drilling; and
 - Where topography would allow, interim reclamation of pits and pads would occur within 1 year of the spud date.

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- **Sand Hills Special Management Area (SMA).** This area is a popular hunting spot and is generally isolated from oil and gas development activities. There is currently an extensive network of two track routes in this area. The gently rolling terrain has stabilized sand dunes and unique vegetation communities that contribute to high wildlife values. This area would need reduced road densities and to restrict some public access conditions, especially on newly constructed roads. To develop additional roads, operators could reclaim mile-for-mile current roads in the area, plus reclaim existing roads to reduce road density to 3 miles/mile². Fences could be converted to BLM standards for improved wildlife passage. Surface disturbance would be limited in silver sagebrush/bitterbrush communities in addition to those identified for vegetation resources. No surface disturbance would be allowed within the 18 acres surrounding the historical JO Ranch buildings.
- **Cow Butte/Wild Cow SMA.** This area is a popular hunting spot and is generally isolated from oil and gas development activities. There is currently an extensive network of two track routes in this area. Terrain is generally steep with highly erosive soils. The area has high wildlife values due to the vegetation communities. To develop additional roads, operators could reclaim mile-for-mile current roads in the area plus existing roads to reduce road density to 3 miles/mile². Development protection measures would reduce pad density. Fences could be converted to BLM standards for improved wildlife passage.
- **Historic Trails SMA.** Historical trails are a unique cultural resource documenting the difficult journeys made in the early West. Within the ARPA, three trails are eligible for the National Register of Historic Places. These areas would receive the following development protection measures: low-impact road design would be used and interim reclamation would be completed within 1 year of the spud date, no surface disturbance would be allowed within a quarter mile of contributing segments, and road or pipeline collocation would be required and trail crossings permitted only in areas of previous disturbance. Extensive efforts would be made to minimize the visual impact and surface disturbance.
- **Upper Muddy Creek Watershed/Grizzly SMA.** Muddy Creek contains critical habitat for BLM sensitive fish species. This area is generally isolated from oil and gas development activities. There is currently an extensive network of two track routes in this area. In general it has poor soils and high wildlife values. Current road densities and public access conditions would be maintained. To develop additional roads, operators could reclaim mile-for-mile current roads in the area plus existing roads to reduce road density to 3 miles/mile². Fences could be converted to BLM standards for improved wildlife passage. Detailed planning specific to this area would be required, and roads in general would require more mitigation and design than in other areas. Where slopes are generally steeper than 8 percent, no surface disturbance would be allowed (44 percent of this SMA is within the project area). No new road crossings of Muddy Creek would be allowed.

1.2.4 Alternative D

The goal of this alternative is to minimize surface disturbance while optimizing natural gas recovery. Annual planning between the operators and the BLM, as proposed in the Proposed Action, will be a key component of this alternative. Annual planning will require the operators to submit to the BLM their proposed plan of operation for the forthcoming year. The BLM will then

work with the operators at a site-specific level (Application for Permit to Drill [APD]) to minimize surface disturbance by applying the appropriate lease stipulations, conditions of approval, best management practices, and any other measures deemed necessary to minimize surface disturbance and still allow for the recovery of natural gas.

Coal bed and conventional natural gas resources would be developed while intensive reclamation activities would stabilize disturbed soils and vegetation communities. For the overall Atlantic Rim area, no more than 7,600 acres of the project area would be disturbed and unsuccessfully reclaimed at any time. For the overall Atlantic Rim area, there would be a 6.5 acres/well pad short-term disturbance goal (2.8 percent of the ARPA). Those areas designated as *Category A* would have a short-term disturbance goal of less than 6.5 acres/well pad. Category A, as depicted on map M-7 (USDI-BLM 2006, appendix M), incorporates areas with sensitive fish populations and crucial wildlife habitats, including as unique vegetation communities, and is about 72,200 acres in extent.

The pace of development analyzed is the same as disclosed on figure 4-6 of the EIS. As disturbance levels increase from natural gas development activities, reclamation efforts would intensify. If the disturbance limit should be reached, further disturbance activities would be halted pending successful reclamation. Upon reclamation success further natural gas development proposals would be considered and approved as appropriate under the disturbance limit. Reclamation success is achieved when the criteria listed in section 2 ("Criteria for Reclamation Success") of the EIS Reclamation Plan (USDI-BLM 2006, appendix B) are met.

Disturbance levels would be determined through geo-spatial shapefiles provided annually by the operators in accordance with the EIS Reclamation Plan (USDI-BLM 2006, appendix B). Reclamation would be reviewed, at a minimum, annually. For those areas needing further work, adaptive management using appropriate best management practices would be implemented to ensure subsequent reclamation success. Operators would propose and implement reclamation measures that would be used the following growing season for both areas with reclamation problems and newly disturbed areas.

2 Methods

The assessments and recommendations contained within this BA are based upon information obtained from several sources: 1) published literature, 2) unpublished agency reports and data, 3) personal communications with state and federal agency wildlife specialists, 4) meetings with state and federal agency plant and wildlife specialists, and 5) field surveys.

2.1 Published Literature

Published scientific documents that pertain directly to the specific circumstances and issues involved in this analysis were reviewed and incorporated into this BA. All published literature used in this assessment is appropriately cited.

2.2 Unpublished Agency Reports and Data

Unpublished documents and data sets from the files of the WGFD and the U.S. Fish and Wildlife Service (USFWS) were reviewed, utilized, and referenced in this BA. All available information on threatened and endangered species in the project area was reviewed in the preparation of the EIS and this BA. Materials reviewed include distribution and habitat maps,

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progress reports, recovery plans, sighting records, management plans, and survey guidelines for threatened and endangered species.

Some information concerning historical wildlife usage of the project area was obtained through Rawlins BLM Field Office and District IV biologists of the WGFD. This information was specific to current and historical locations for wildlife species. Additional information was obtained from the WGFD, which maintains a computerized listing of all wildlife species reported in an area. This listing, known as the Wildlife Observation System (WOS) was accessed for information concerning all species of wildlife (birds, mammals, amphibians, and reptiles) that have been observed and recorded within the ARPA and a township buffer (T12-21N, R88-93W) as residents or seasonal migrants. The Wyoming Natural Diversity Database (WYNDD) was also queried for reports of rare or unique plant and wildlife species within the ARPA.

2.3 Personal Communications

Individuals interviewed during the fact-finding process, either directly or by telephone, included the following:

- Mr. Frank Blomquist (BLM Wildlife Biologist, Rawlins, WY),
- Ms. Pat Deibert (USFWS Biologist, Cheyenne, WY),
- Ms. Kathleen Erwin (USFWS Biologist, Cheyenne, WY),
- Mr. Walt Fertig (WYNDD Heritage Biologist, Laramie, WY),
- Ms. Mary Read (BLM Wildlife Biologist, Rawlins, WY),
- Mr. Andy Warren (BLM Supervisory Rangeland Management Specialist, Rawlins, WY),
- Mr. Greg Hiatt (WGFD Wildlife Biologist, Sinclair, WY), and
- Mr. Tim Woolley (WGFD Wildlife Biologist, Baggs, WY).

2.4 Meetings

Numerous meetings were held among state and federal wildlife specialists and Hayden-Wing Associates (HWA) concerning potential impacts to wildlife that may result from the proposed project. All of the concerns raised in these meetings regarding development of the proposed project have been addressed in either this BA or the EIS (USDI-BLM 2006).

2.5 Field Surveys

Existing special-status wildlife information for the project area was supplemented through wildlife surveys conducted by HWA from 2000 to 2004. These data collections consisted of aerial and ground surveys to determine 1) the occurrence of threatened, endangered, proposed, candidate, or sensitive species and habitat that may occur on the project area; 2) the occurrence, location, and size of white-tailed prairie dog colonies; and 3) the location and activity status of raptor nests within the project area and within a 1-mile buffer zone.

2.6 Biological Assessment Preparation

Personnel who cooperated in the preparation of this BA include the following:

- L.D. Hayden-Wing—principal investigator of HWA and a member of the Inter-Disciplinary Team—supervised the collection of wildlife data and compilation of the overall BA.

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- T. Olson—wildlife biologist with HWA—and B. Parkhurst prepared the BA.
- J. Winstead, K. Jones, T. Olson, L. Bennett, and D. Knowlton—wildlife biologists with HWA—assisted in the collection of field data.
- Frank Blomquist (BLM, Rawlins Field Office) and Amber Travsky (Real West Consultants) reviewed and finalized the document.

3 Current Status and Habitat Use of Species

The USFWS has determined that nine species—which are listed under the ESA as either threatened, endangered, or proposed species or are candidates for listing under the ESA—are potentially present within the area administered by the Rawlins BLM Field Office (USDI-FWS 2004a, table 1). In addition, ten species—which are found downstream of the area administered by the Rawlins BLM Field Office in the Platte and Colorado River systems—may potentially be impacted if water depletions occur. These species are listed in table G-1, along with their federal status under the ESA.

The following subsections describe the current status and habitat use of these species.

Table G-1. Threatened, Endangered, Proposed, or Candidate Species That Might Be Present within the Area Administered by the Rawlins BLM Field Office or That Might Be Impacted by the Proposed Action.

Common Name	Scientific Name	Status
Mammals		
Black-footed Ferret	<i>Mustela nigripes</i>	Endangered
Canada lynx	<i>Lynx Canadensis</i>	Threatened
Preble's meadow jumping mouse	<i>Zapus hudsonius preblei</i>	Threatened
Birds		
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Candidate
Whooping crane ¹	<i>Grus Americana</i>	Endangered
Interior least tern ¹	<i>Sterna antillarum</i>	Endangered
Piping plover ¹	<i>Charadrius melodus</i>	Threatened
Eskimo curlew ¹	<i>Numenius borealis</i>	Endangered
Amphibians		
Wyoming toad	<i>Bufo baxteri</i>	Endangered
Fish		
Colorado pikeminnow ²	<i>Ptychocheilus lucius</i>	Endangered
Bonytail ²	<i>Gila elegans</i>	Endangered
Humpback chub ²	<i>Gila cypha</i>	Endangered
Razorback sucker ²	<i>Xyrauchen texanus</i>	Endangered

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Table G-1. Threatened, Endangered, Proposed, or Candidate Species That Might Be Present within the Area Administered by the Rawlins BLM Field Office or That Might Be Impacted by the Proposed Action.

<i>Fish</i>		
Pallid Sturgeon ¹	<i>Scaphirhynchus albus</i>	Endangered
<i>Plants</i>		
Blowout penstemon	<i>Penstemon haydenii</i>	Endangered
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	Threatened
Colorado butterfly plan	<i>Gaura neomexicana</i> ssp. <i>Coloradensis</i>	Threatened
Western prairie fringed orchid	<i>Platanthera praeclara</i>	Threatened

3.1 Threatened, Endangered, Proposed, and Candidate Species

3.1.1 Black-Footed Ferret

The black-footed ferret's original distribution in North America closely corresponded to that of prairie dogs (Hall and Kelson 1959, Fagerstone 1987). In Wyoming, prairie dog (*Cynomys* spp.) colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food and they also use prairie dog burrows for shelter, parturition, and raising young (Hillman and Clark 1980, Fagerstone 1987). Prairie dog towns occurring within the project area were initially located from the air and subsequently mapped from the ground in their entirety. Prairie dog colonies were mapped from an ATV or on foot using a hand-held Global Positioning System (GPS) receiver. Additional studies identified a total of 295 white-tailed prairie dog colonies that comprised 6,300 acres within the ARPA (equal to 2.3 percent of the area).

On February 2, 2004, the USFWS issued a letter stating that, in Wyoming, surveys for black-footed ferrets are no longer warranted in black-tailed prairie dog complexes and in many white-tailed prairie dog complexes, except for 16 non-block-cleared, white-tailed prairie dog complexes (USDI-FWS 2004b). One of these complexes, the Dad Complex is located partially within the ARPA. For the ARPA, a total of 273 white-tailed prairie dog colonies (covering 5,720 acres) are located within the Dad Complex and are not included under the block clearance. Therefore, surveys for black-footed ferrets may be warranted before ground-disturbing activities within these prairie dog colonies. Surveys would be conducted according to USFWS guidelines (USDI-FWS 1989). The remaining white-tailed prairie dog colonies within the ARPA have been block-cleared and surveys for black-footed ferrets are no longer warranted. However, these towns located within the block-clearance area should be examined for their potential to provide habitat for relocation of black-footed ferrets.

3.1.2 Canada Lynx

The Canada lynx is one of three major species of wildcats found in North America. Although Wyoming is a part of the species' historic geographical range, no lynx sightings have been documented in the ARPA or within a 6-mile buffer (WGFD 2003). The closest known sighting of a lynx to the ARPA is approximately 55 miles to the east (Reeve et al. 1986 and

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Beauvais et al. 2001). In a collaborative effort, the BLM and the WYNDD completed a lynx habitat suitability map for the State of Wyoming (Beauvais et al. 2001). According to the habitat map, lands within the ARPA provide low to poor quality lynx habitat. Lynx could potentially travel through the ARPA, but the likelihood of this is very low due to a lack of suitable habitat.

It is unlikely that lynx occur within or near the ARPA due to the facts that:

1. The project area does not include high elevation lodgepole pine/spruce-fir habitat types preferred by this species,
2. The project area does not support a population of snowshoe hares (WGFD 2003),
3. There are no recorded lynx sightings within a 6-mile buffer in either the WOS (WGFD 2003) or the WYNDD (2003), and
4. The closest potential habitat is approximately 6 miles to the east in the Sierra Madre Mountains.

Because lynx are unlikely to occur within or near the project area, they are not discussed further in this BA.

3.1.3 Preble's Meadow Jumping Mouse

In Wyoming, Preble's meadow jumping mouse is found within riparian habitat corridors east of the Laramie Range Mountains and south of the North Platte River (USDI-FWS 2004a). Preble's meadow jumping mouse is closely related to the western jumping mouse, and subspecies are generally identified by geographic location (Beauvais 2000). The ARPA is located more than 100 miles west of the known distribution of the Preble's meadow jumping mouse and this species is not expected to occur on the project area and is therefore not discussed further in this document.

3.1.4 Bald Eagle

Bald eagles typically build stick nests in the tops of coniferous or deciduous trees along streams, rivers, or lakes. Selection of nest sites likely depends upon availability of food in the early nesting season (Swenson et al. 1986). Although no bald eagle nests or nesting habitat occurs within the project area, nesting habitat does occur south of the project area along the Little Snake River. Primary wintering areas are typically associated with concentrations of food sources including major rivers that remain unfrozen where fish and waterfowl are available and ungulate winter ranges where carrion is available (Montana Bald Eagle Working Group 1990).

Bald eagles have been observed within the project area primarily during December, January, and February (WGFD 2003). The majority of bald eagle locations within the project area are in the southern portion of the ARPA close to the Little Snake River. Bald eagles may utilize the project area for foraging during winter months because a large portion of the area consists of winter range for antelope, mule deer, and elk.

The bald eagle winters and nests in proximity to the project area along the Little Snake River. Several ecological factors probably enable seasonal and year-round use by bald eagles along the Little Snake River:

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1. Some water may remain open on the river year-round providing an adequate supply of fish and waterfowl,
2. The river is adjacent to crucial ungulate winter range, and
3. The riparian zone has many large cottonwood trees for roosting and nesting.

This habitat along the Little Snake River is located 0.5 to 2 miles south of the ARPA. Upland habitat use by bald eagles within the project area would probably be limited to winter scavenging forays. Few trees large enough for eagle roosting or nesting exist within the project area. HWA reviewed BLM raptor nest records, WGFD WOS records, and results of aerial and ground raptor nest surveys and found no records of occurrence of bald eagle nests within the ARPA.

3.1.5 Yellow-Billed Cuckoo

The yellow-billed cuckoo is a neotropical migrant that winters in South America and breeds from southeastern Canada, throughout most of the United States (except the northern Great Plains to the northwest coast), and northern Mexico (Payne 1997). In North America, the cuckoo population is divided into two subspecies. The population west of the Continental Divide is considered the Western or California subspecies and the population east of the Continental Divide is the Eastern subspecies. Trends developed from Breeding Bird Survey (BBS) data indicate that the yellow-billed cuckoo is declining throughout its range, but that the most dramatic declines have been associated with the Western subspecies.

As a result, the yellow-billed cuckoo has twice been petitioned as an endangered species pursuant to the ESA. The Southwest Region of the USFWS rejected the first petition submitted in 1987. The second petition was submitted in 1998 and called for the listing of cuckoos west of the Continental Divide as a subspecies or a geographically, morphologically, behaviorally, and ecologically distinct population from cuckoos east of the Continental Divide. In July 2001, the USFWS concluded that the petitioned action was warranted, but precluded listing actions by higher priority. Currently, the Western subspecies of yellow-billed cuckoo (located west of the Continental Divide) is considered a candidate species.

Observations of the yellow-billed cuckoo in Wyoming are very rare, with approximately 24 documented observations since 1982 (Bennett 2002). The yellow-billed cuckoo is a BLM-sensitive species throughout all of Wyoming and it may be found in cottonwood/riparian habitats below 7,000 feet and in urban areas throughout the state (WGFD 1999). In Wyoming, it is thought to prefer cottonwood stands for foraging and willow thickets for nesting.

The ARPA does not include any large riparian areas with well-developed cottonwood/riparian habitats; therefore, it is unlikely that the yellow-billed cuckoo occurs within the project area. Also, the yellow-billed cuckoo has not been documented on the ARPA (WGFD 2003, WYNDD 2003). It is therefore not discussed further in this BA.

3.1.6 Wyoming Toad

The Wyoming toad was historically associated with floodplain ponds along the Big and Little Laramie Rivers in Albany County (Baxter and Stone 1992). Currently, the Wyoming toad is only known to occur at Mortenson Lake National Wildlife Refuge. However, reintroduction efforts are underway in other portions of its former range. The Wyoming toad did not historically, and

does not currently, occur on or near the ARPA and is therefore not discussed further in this document.

3.1.7 Blowout Penstemon

Blowout penstemon is a member of the Scrophulariaceae (Figwort) family (Fertig 2001) and is probably the rarest plant species native to the Great Plains (NGPC 2002). The species is most common in the open, sandy habitats of wind-excavated depressions (blowouts) in dune tops. In Wyoming, the species has also been documented on very steep, unstable sand dunes (Fertig 2001). Within these limited habitats, this short-lived perennial frequently occurs in large, multi-stemmed clumps. When in bloom in Wyoming in June and July, its lavender-purple flowers stand out against other sparse vegetation found in and around sandy blowouts. In addition to features of its leaves and flowers, blowout penstemon's lavender or vanilla-like fragrance distinguishes it as only one of two fragrant species of the 300 penstemons in the world (NGPC 2002).

The reproductive life history of the species has led, in part, to the decline of blowout penstemon populations in Wyoming and other native regions. The primary limiting factor in seedling establishment is moisture availability. For blowout penstemon seeds to germinate, and for the roots to reach a depth where moisture is available and constant, blowout sand must remain damp for at least 2 weeks during the growing season (NGPC 2002). In the arid environment of sandy blowouts, these conditions usually only occur in one out of every 8 to 10 years (NGPC 2002). Exacerbating the effects of limited germination and establishment conditions is the loss of blowout habitats. Active fire suppression programs and improved range management practices have led to increases in prairie vegetation cover with decreases in sandy areas. The species now remains in only a few locations where wind erosion has maintained sandy blowouts (NGPC 2002).

Blowout penstemon is known to occur in certain habitats south of the Ferris Mountains in the northern part of Carbon County. The plant has the potential to occur on the project area (Fertig 2001, USDI-FWS 2002), especially in the Sand Hills area where a few active sand dunes are known to exist (Warren 2002). However, the species was not found during field surveys of this area by WYNDD personnel in June 2000 (Fertig 2001).

3.1.8 Ute Ladies'-Tresses

Ute ladies'-tresses is a perennial, terrestrial orchid with stems 8 to 20 inches tall and flowers consisting of white or ivory flowers clustered into a spike arrangement at the top of the stem. The plant blooms mainly from late July through August; however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October. Habitat for Ute ladies'-tresses can occur in major riparian corridors subject to fluvial erosion/deposition or, more ideally, in moist to very wet meadows along streams. It has also been found in abandoned stream meanders that still have ample groundwater, near springs, and lakeshores. The habitat on which the species depends has been drastically modified by urbanization, agriculture, and development (This description was adapted from NatureServe [2003]).

Ute ladies'-tresses was designated as threatened in 1992 when it was only known from Colorado, Utah, and Nevada. Since that time, it has been found in Wyoming, Montana, Nebraska, and Idaho (NatureServe 2003). The known locations of the species in Wyoming include Converse, Goshen, Laramie, and Niobrara Counties. Much of the ARPA is located

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above the upper known elevation of occurrence (6,800 feet) for this species (Fertig 2000a) and the species is not known to occur within the ARPA. However, some areas along the eastern portion of the ARPA may contain marginal habitats for the Ute ladies'-tresses.

3.1.9 Colorado Butterfly Plant

The Colorado butterfly plant is a short-lived perennial herb that typically occurs on sub-irrigated soils on level or slightly sloping floodplains and drainage bottoms at elevations of 5,000–6,400 feet (Fertig 2000b). The species is often found a short distance from meandering stream channels. This species is known to occur in Laramie County in southeastern Wyoming, in southwestern Nebraska, and in northeastern Colorado. This species is not known and is not expected to occur within or near the ARPA and is therefore not discussed further in this document.

3.2 Colorado River Species

Within the ARPA, a total of approximately 284 miles of intermittent, ephemeral, and perennial streams occur. Perennial surface water is relatively scarce within the ARPA due to limited precipitation (5.8–24.3 inches/year). The majority of drainages within the ARPA are ephemeral drainages. Ephemeral waters are those in which the water table is always below the stream channel and only flow in direct response to precipitation or snow melt. Ephemeral waters only support very limited aquatic communities for the short periods when surface flow is present. However, Muddy Creek, its tributaries McKinney Creek and Littlefield Creek, and Savery Creek are perennial streams. The Wyoming Department of Environmental Quality classifies these streams as Class 2 and 3, which support game and non-game species. These streams are considered to be locally to regionally important trout fisheries by the WGFD (1991 and 1998).

About 15 reservoirs and ponds (0.5–20 acres) are present within the Colorado River watershed portion of the ARPA. Some of the ponds and reservoirs that currently exist within the ARPA are fed by waters recovered from wells drilled at upstream locations, while others are impoundments on small drainages. These man-made impoundments are generally designed to supply water for livestock and wildlife use.

Four federally endangered fish species may occur as downstream residents of the Colorado River system: Colorado pikeminnow (*Ptychocheilus lucius*), bonytail (*Gila elegans*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) (USDI-FWS 2004a). The Colorado pikeminnow, bonytail, and humpback chub are all members of the minnow family. The razorback sucker is a member of the sucker family. All four of these fish species share similar habitat requirements and historically occupied the same river systems.

The last sighting of any of these fish species in the Little Snake River was of a single Colorado pikeminnow in 1990. Because habitat for these species is not present within the ARPA, these fish species are not likely to be found in tributaries to the Little Snake River within the ARPA, and critical habitat for these species has not been designated in Wyoming (Upper Colorado River Endangered Fish Recovery Program 1999). However, the potential for project-related reductions in water quantity or quality to these tributaries to the Colorado River warrant their inclusion in this document.

3.2.1 Colorado Pikeminnow

The Colorado pikeminnow is the largest member of the minnow family and occurs in the swift, warm waters of Colorado Basin rivers. The species was once abundant in the main stem of the Colorado River and most of its major tributaries throughout Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, California, and Mexico. It was known to occur historically in the Green River of Wyoming at least as far north as the city of Green River. In 1990, one adult was collected from the Little Snake River in Carbon County, Wyoming (Baxter and Stone 1995). Subsequent survey attempts to collect Colorado pikeminnow from this area of the Little Snake River by WGFD personnel failed to yield any other specimens.

3.2.2 Bonytail

Habitat of the bonytail is primarily limited to narrow, deep, canyon-bound rivers with swift currents and white water areas (Valdez and Clemmer 1982, Archer et al. 1985, and Upper Colorado River Endangered Fish Recovery Program 1999). With no known reproducing populations in the wild today, the bonytail is thought to be the rarest of the endangered fishes in the Colorado River system.

The bonytail historically inhabited portions of the upper and lower Colorado River Basin. Today, in the upper Colorado River Basin, only small, disjunct populations of bonytail are thought to exist in the Yampa River in Dinosaur National Monument, in the Green River at Desolation and Gray Canyons, in the Colorado River at the Colorado/Utah border, and in Cataract Canyon (Upper Colorado River Endangered Fish Recovery Program 1999).

3.2.3 Humpback Chub

Habitat of the humpback chub is also limited to narrow, deep, canyon-bound rivers with swift currents and white water areas (Valdez and Clemmer 1982, Archer et al. 1985, and Upper Colorado River Endangered Fish Recovery Program 1999). The humpback chub was historically found throughout the Colorado River system and its tributaries, which are used for spawning (Valdez et al. 2000). It is estimated that the humpback chub currently occupies 68 percent of its original distribution in five independent populations that are thought to be stable (Valdez et al. 2000).

3.2.4 Razorback Sucker

The razorback sucker is an omnivorous bottom feeder and is one of the largest fishes in the sucker family. Adult razorback sucker habitat use varies depending on season and location. This species was once widespread throughout most of the Colorado River Basin from Wyoming to Mexico. Today, in the Colorado River Basin, populations of razorback suckers are only found in the upper Green River in Utah, the lower Yampa River in Colorado, and occasionally in the Colorado River near Grand Junction (Upper Colorado River Endangered Fish Recovery Program 1999).

3.3 Platte River Species

A small portion of the ARPA drains into the Platte River system and, according to the USFWS (USDI-FWS 2004a), water depletions in the Platte River system may contribute to the destruction or adverse modification of designated critical habitat for the following species. None

of these species or their habitats are found within the ARPA, but they could be impacted by actions taken on the ARPA.

3.3.1 Whooping Crane

Critical habitat for the whooping crane downstream of the ARPA is located along the Platte River bottoms between Lexington and Dehman, Nebraska (Federal Register 1978). Whooping crane habitat consists of large expanses of wetlands that provide suitable food (insects, crayfish, frogs, small fish, etc.) and open expanses near wetlands for nightly roosting (Federal Register 1978).

3.3.2 Interior Least Tern

The interior least tern nests on unvegetated sand-pebble beaches and islands of large reservoirs and rivers. Interior least terns avoid areas where relatively thick vegetation provides cover for potential predators. No habitat for the interior least tern is found on the ARPA, but habitat is located downstream of the ARPA along the Platte River in Nebraska (USDI-FWS 1990).

3.3.3 Piping Plover

Critical habitat for the piping plover includes prairie alkali wetlands and surrounding shoreline to 200 feet of uplands above the high water mark; river channels and their associated sandbars and islands; reservoirs and their sparsely vegetated shorelines, peninsulas, and islands; and inland lakes and their sparsely vegetated shorelines and peninsulas (Federal Register 2002). Critical habitat for the species downstream of the ARPA in Nebraska begins at the Lexington Bridge and extends to the Platte's confluence with the Missouri River 252 miles (405.5 kilometers) downstream (Federal Register 2002). Approximately a quarter of this part of the Platte River is also designated as critical habitat for the whooping crane. Open shorelines and sandbars of rivers, large reservoirs, alkali wetlands, lakes, and rivers provide suitable breeding habitat for the piping plover.

3.3.4 Eskimo Curlew

The eskimo curlew migrates from wintering grounds in the pampas of Argentina, northward through Central America and the central Great Plains of North America to breeding grounds in northern Canada and Alaska (Gollop et al. 1986). The spring migration route passes through Nebraska, where the birds may stop over along the Platte River. In the fall they migrate eastward to Labrador, then south over the Atlantic Ocean back to South America (Gollop et al. 1986). Habitat for the eskimo curlew includes grasslands, tundra, burned prairies, plowed fields, marshes, mudflats, meadows, and pastures. Burned prairies and marshes may be attractive during migration (Gollop et al. 1986). The loss of prairie habitat in North America may have contributed to the decline of the eskimo curlew, but the primary reason for the rarity of the bird was market hunting in the late 1800s and early 1900s (Gollop et al. 1986). No suitable habitat for the eskimo curlew occurs on the ARPA and the species has not been reported within or near the ARPA (WGFD 2003, WYNDD 2003).

3.3.5 Pallid Sturgeon

The pallid sturgeon is a native fish found in the Mississippi/Missouri River system. The pallid sturgeon is present in the Platte River, a tributary to the Missouri River, located downstream

from a portion of the ARPA. Suitable habitat for the pallid sturgeon consists of large turbid rivers with sand or gravel bottoms. The pallid sturgeon is threatened by habitat degradation such as decreased turbidity, which can be caused by impoundments.

3.3.6 Western Prairie Fringed Orchid

The western prairie fringed orchid is a long-lived perennial herb with stems that can grow to 1.2 meters tall from an underground tuber. The plant blooms for about a 3-week period starting in mid-June in the southern portion of its range to late July in the north. Habitat of the western prairie fringed orchid is the western portions of the North American tallgrass prairie. It is most commonly observed on moist, calcareous soils; sub-saline prairies; and sedge meadows (many flooded for a period of 1–2 weeks during the year). Published accounts and herbarium records suggest that this plant was widespread and perhaps locally common before European settlement. Declines are due to the extensive and ongoing conversion of the tallgrass prairie to agricultural uses throughout its range (This description was adapted from NatureServe [2004]).

The western prairie fringed orchid was designated as a threatened species in its entire range in 1989. Within the area covered by this listing, this species is known to occur in Iowa, Kansas; Minnesota; Missouri; North Dakota; Nebraska; Oklahoma; and in Manitoba Province, Canada (NatureServe 2003).

4 Direct and Indirect Impacts of the Proposed Project

The EIS (USDI-BLM 2006) for the ARPA selected Alternative D as the preferred alternative, as defined in section 1.2.4. Under Alternative D, up to 13,000 acres of wildlife habitat would be disturbed by construction activities over the next 20 years. With interim reclamation of disturbed habitats, the total unreclaimed disturbance area is capped at 7,600 acres (2.8 percent of the ARPA) at any point in time. Reclamation would reduce impacts to 5,000 acres or 1.9 percent of the ARPA by the end of the development phase of the project. Reclamation success will be influenced by timing of reclamation and climatic conditions.

Although the total acres of wildlife habitat that would be disturbed under Alternative D over the next 20 years is known, the distribution of this disturbance will not be known until actual site-specific well locations and other disturbance activities are determined. To assess the direct and indirect impacts of the proposed project, it was assumed that any section of land might be developed at the level of eight well locations per section.

The following subsections evaluate the direct and indirect impacts of Alternative D on the species carried forward from the evaluation in section 3.

4.1 Threatened, Endangered, Proposed, and Candidate Species

The threatened, endangered, proposed, and candidate species carried forward from section 3 are discussed below and include the black-foot ferret, the bald eagle, blowout penstemon, and the Ute ladies'-tresses.

4.1.1 Black-Footed Ferret

Two hundred and ninety-five white-tailed prairie dog colonies inhabit 6,300 acres within (or 2.3 percent of) the ARPA. A total of 273 white-tailed prairie dog colonies within the ARPA,

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covering 5,720 acres, are located within the Dad Complex and are not included under the block clearance. These colonies meet requirements for consideration as black-footed ferret habitat (Biggins et al. 1989). Development of the Proposed Action would likely result in direct disturbance of some portions of these prairie dog colonies.

Surveys for black-footed ferrets may be required before ground-disturbing activities within prairie dog colonies located in the Dad Complex. Surveys would be conducted according to USFWS guidelines (USDI-FWS 1989). The remaining white-tailed prairie dog colonies within the ARPA are in the block clearance area, where surveys for black-footed ferrets are no longer required. However, these towns located within the block-clearance area should be examined for their potential to provide habitat for relocation of black-footed ferrets.

Projects would not be authorized within white-tailed prairie dog colonies within the Dad Complex unless surveys for black-footed ferrets have been completed. If surveys are required, consultation with the USFWS will be initiated before the surveys are conducted. If black-footed ferrets are found, no project-related disturbance will occur within the prairie dog complex and all project-related activities in such towns or complexes shall be suspended immediately. The USFWS will be notified within 24 hours if a black-footed ferret or sign thereof is observed. Although black-footed ferrets may be affected by this project, as long as the prescribed avoidance and protective measures (listed in section 6) are implemented, they are unlikely to be adversely affected.

4.1.2 Bald Eagle

Bald eagles have been observed within the project area primarily during December, January, and February (WGFD 2003). The majority of bald eagle locations within the project area are in the southern portion of the ARPA close to the Little Snake River. Bald eagles may utilize the project area for foraging during winter months because a large portion consists of winter range for antelope, mule deer, and elk.

Upland habitat use by bald eagles within the project area would probably be limited to winter scavenging forays. Few trees large enough for eagle roosting or nesting exist within the project area. HWA reviewed BLM raptor nest records, WGFD WOS records, and results of aerial and ground raptor nest surveys and found no records of occurrence of bald eagle nests within the ARPA. The southern portion of the project area, closest to the Little Snake River, has the highest potential for bald eagle occurrence. This portion of the ARPA contains crucial winter range for elk, mule deer, and pronghorn.

The potential for vehicle collisions with big game would increase as a result of increased vehicular traffic associated with the presence of construction crews and activities in the project area. Because bald eagles commonly feed on carrion, particularly during the winter months, they would be attracted to road-killed big game carcasses on and adjacent to the access roads. Eagles feeding on these carcasses are in danger of being struck by moving vehicles. Any increase in the death rate of bald eagles from vehicular collisions will constitute a significant impact. Because the potential for an increase in the incidence of vehicle-eagle encounters exists, measures to avoid or reduce such incidents shall be taken. Such measures shall include the following:

1. Regular drivers shall undergo training that describes the circumstances under which vehicular collisions with bald eagles are likely to occur and the measures that can be taken to minimize them, including reduced speeds.

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2. Operations personnel shall be prohibited from unnecessary off-site activities and all project employees shall be informed of applicable wildlife laws and penalties associated with unlawful take and harassment of bald eagles.
3. Vehicle-killed carcasses shall be removed from the right-of-ways of access roads within the project area to eliminate the exposure of carrion-feeding eagles to the threat of being struck by vehicles.
4. Operators shall internally enforce existing drug, alcohol, and firearm policies.

Given the implementation of these measures, the bald eagle might be affected, but is not likely to be adversely affected.

4.1.3 Blowout Penstemon

Blowout penstemon is known to occur in certain habitats south of the Ferris Mountains in the northern part of Carbon County. The plant has the potential to occur within the project area (Fertig 2001 and USDI-FWS 2002) only in the Sand Hills area where a few active sand dunes are known to exist (Warren 2002). However, the species was not found during field surveys of this area by WYNDD personnel in June 2000 (Fertig 2001). Given the presence of potential habitat within the ARPA, implementation of the proposed project's alternatives might directly impact some individual plants of this species. If this species is found within the ARPA, the specific sites where it is found shall be avoided to prevent any potential impacts.

4.1.4 Ute Ladies'-Tresses

The known locations of Ute ladies'-tresses in Wyoming include Converse, Goshen, Laramie, and Niobrara Counties. Potentially suitable habitats for this species are very limited within the ARPA. This species is not known to occur within the ARPA and the likelihood of it occurring in the ARPA is low due to the following reasons: 1) much of the ARPA is very arid and there are few perennial streams, 2) the elevation of the project area is near the upper limit for the species, 3) very few moist riparian area meadows are present, 4) the transition from stream margins to upland vegetation is abrupt, and 5) the species has only been located in eastern and southeastern Wyoming (Fertig 2000a). Given the presence of potential habitat within the ARPA, there is a slight chance of impacts due to the low likelihood of it occurring. If this species is found within the ARPA in the future, the specific sites where it is found shall be avoided to prevent any potential impacts.

4.2 Colorado River Species

Four federally endangered fish species might occur as downstream residents of the Colorado River system: Colorado pikeminnow, bonytail, humpback chub, and razorback sucker (USDI-FWS 2004a). All four of these fish species share similar habitat requirements and historically occupied the same river systems. Declines in populations of these species are mainly attributed to impacts of water development (e.g., dams and reservoirs) on natural temperature and flow regimes, creation of migration barriers, habitat fragmentation, the introduction of competitive and predatory non-native fishes, and the loss of inundated bottom lands and backwater areas (Minckley and Deacon 1991 and USDI-FWS 1993).

Under the Proposed Action and the proposed alternatives, no produced water will be discharged to the Colorado River system; therefore, produced water discharges do not pose a risk to these

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species. Implementation of all appropriate mitigation measures for water resources and soils identified in the ARPA would prevent potential downstream sedimentation and contamination caused by construction activities. Therefore, water quality in the Colorado River system is not expected to be impacted by the Proposed Action.

Limited water depletions within the Colorado River system are expected from drilling activities within the ARPA. Water depletion from the Colorado River system as a result of road/pad construction and dust abatement would be approximately 10.3 acre-feet per year for the entire project area. Water depletions to the Colorado River system as a result of this project might adversely affect these four fish species. This determination is based on the Recovery and Implementation Program for Endangered Fish Species in the Upper Colorado River Basin, which was initiated on January 22, 1988.

The recovery program was intended to be the reasonable and prudent alternative that avoided jeopardy to the endangered fish by depletions from the upper Colorado River. The recovery program required that a depletion fee be paid to help support the recovery program if a project results in depletion. On July 5, 1994, the USFWS issued a biological opinion determining that the fee for depletions of 100 acre-feet or less would no longer be required. This opinion was based on the premise that the recovery program has made sufficient progress as the reasonable and prudent alternative and therefore avoided the likelihood of jeopardy to the endangered fishes and destruction or adverse modification of their critical habitat by depletions of 100 acre-feet or less.

Because water depletion due to this project is less than 100 acre-feet per year, a mitigation fee would not be applicable.

4.3 Platte River Species

The whooping crane, interior least tern, piping plover, Eskimo curlew, pallid sturgeon, and western prairie fringed orchid are all found downstream of the ARPA along the Platte River. No habitat for any of these species occurs on the ARPA and they are not likely to occur there. Under the Proposed Action and the proposed alternatives, no produced water will be discharged to the Platte River system; therefore, produced water discharges do not pose a risk to these species. Implementation of all appropriate mitigation measures for water resources and soils identified in the ARPA would prevent potential downstream sedimentation and contamination caused by construction activities. Therefore, water quality in the Platte River system is not expected to be impacted under the Proposed Action and the proposed alternatives. No water depletion from the Platte River system will occur as a result of the proposed project.

5 Cumulative Impacts

The cumulative impact analysis (CIA) approach is used to evaluate the influences of recent, past, present, and reasonably foreseeable future human developments on the local wildlife biological resources. This approach examines impacts associated with a proposed project in context with all other past and future developments, whether or not they are related. It also allows the wildlife manager and land management agency to evaluate impacts on a broader scale. The BLM recommends evaluating cumulative impacts on a watershed basis for natural resources related to watershed function and stability.

Existing disturbance within the ARPA is approximately 763 acres or around 0.28 percent of the 270,080 acres of the project area. During the construction phase, the Proposed Action would disturb up to 15,800 acres or 5.9 percent of the overall project area, Alternative A (no action) would not disturb any acreage, Alternative C is estimated to disturb approximately 13,286 acres (4.9 percent of the ARPA), and Alternative D would disturb up to 13,000 acres (4.8 percent of the ARPA) with a cap of 7,600 acres of unreclaimed disturbance at any one time. Disturbance areas within the ARPA would be reduced upon reclamation of pipeline right-of-ways, unused portions of the drill pad, portions of roads, and ancillary facility disturbances during the production phase for each alternative, resulting in long-term disturbance of about 6,200 acres under the Proposed Action and Alternative C, no additional acreage under Alternative A, and 5,000 acres under Alternative D.

5.1 Black-Footed Ferret

Provided that avoidance measures outlined in this document are followed, the potential for an incremental increase in cumulative impacts due to the implementation of the Proposed Action or Alternatives C or D might affect the black-footed ferret, but is not likely to adversely affect the black-footed ferret.

5.2 Bald Eagle

Bald eagles are not known to nest on the ARPA, but might use portions of the project area especially during winter months when carrion is available. Provided that avoidance measures outlined in this BA are followed, the potential for an incremental increase in cumulative impacts due to the implementation of the action alternatives (Proposed Action and Alternatives C and D) or Alternative A (No Action) might affect, but is not likely to adversely affect the bald eagle.

5.3 Blowout Penstemon

Implementation of the Proposed Action and any of the alternatives is not expected to contribute cumulative impacts upon blowout penstemon due to a lack of confirmed occurrences of the species within the ARPA. Should surveys identify populations of blowout penstemon, such populations and associated habitats will be avoided.

5.4 Ute Ladies'-Tresses

Implementation of the Proposed Action and any of the alternatives is not expected to contribute to cumulative impacts upon Ute ladies'-tresses due to a lack of confirmed occurrences of the species within the ARPA. Should surveys identify populations of Ute ladies'-tresses, such populations and associated habitats would be avoided.

5.5 Colorado River Species

On July 5, 1994, the USFWS issued a biological opinion determining that the fee for depletions of 100 acre-feet or less would no longer be required. Cumulative impacts to the endangered fish species that are downstream of the ARPA in the Colorado River are expected to be less than 100 acre-feet per year from the project, under all of the alternatives.

5.6 Platte River Species

These species do not occur on the ARPA and no water depletions to the Platte River system are expected; therefore, implementation of the Proposed Action and any of the alternatives would not contribute to cumulative impacts upon these species.

6 Conservation Measures to Avoid or Reduce Adverse Impacts

The following procedures will be implemented to eliminate or substantially reduce potential adverse impacts of the proposed project to threatened, endangered, proposed, candidate, and petitioned species that might occur within or near the ARPA or that might be impacted by the project.

- If disturbance of prairie dog colonies located within the Dad Complex cannot be avoided, black-footed ferret surveys will be conducted according to USFWS guidelines (USDI-FWS 1989) if the affected towns meet the survey requirements.
- Well pads and disturbances shall be placed 50 meters outside of prairie dog colonies where feasible. In the non-block-cleared areas of the ARPA, any construction would require block surveys for the presence of black-footed ferrets. In those areas that are block-cleared, disturbance is limited to as few a burrows as possible.
- Should black-footed ferrets be documented in a prairie dog complex located within the project area, impacts to the species or its habitat shall be suspended immediately.
- The operators shall conduct educational outreach to employees regarding the nature, hosts, and symptoms of canine distemper and its effects on black-footed ferrets, focusing attention on why pets should be prohibited from work sites.
- All suspected observations of black-footed ferrets, their sign, or carcasses on the ARPA, however obtained, shall be promptly (within 24 hours) reported to the BLM and USFWS.
- All drivers shall undergo a training session describing the type of wildlife in the area that are susceptible to vehicular collisions in order to reduce the potential for vehicle-big-game collisions and subsequent jeopardy to bald eagles feeding on road-killed carrion. The operators shall discuss the circumstances under which such collisions are likely to occur and the measures that could be employed to minimize them. Reduced speed limits shall be implemented to reduce potential for vehicle-wildlife collisions.
- Carcasses shall be removed from access roads, shoulders, and right-of-ways to minimize bald eagle exposure to vehicles.
- Remote monitoring of project facilities would be utilized to the extent possible to reduce human activity levels within the gas field during the production phase.

- All appropriate sedimentation, erosion control, and produced water control measures included in the record of decision will be implemented to avoid changes in water quality or quantity in the streams within the ARPA.
- Construction equipment fueling and servicing areas shall be located at least 150 feet from surface water drainages and riparian areas and away from slopes that drain into those areas.
- High construction standards and rigid safety precautions that adhere to approved design criteria shall be implemented to minimize the potential for an accidental spill or discharge of any chemical or petroleum product into surrounding watershed systems.
- As a safety measure, buffer zones of undisturbed vegetation along water courses shall be maintained to inhibit transport of potentially contaminated runoff to surface waters.

7 Effects of the Project on the Expected Status of Species in the Future

Provided that the conservation measures described above are implemented, the Proposed Action and alternatives are not expected to alter the current status of, or result in any decreased survival of, any of the species discussed in this BA during the project or after project completion.

8 Determination of Effects for Listed Species

8.1 Black-Footed Ferret

Based upon the analyses of the alternatives, the current and potential status of the species in the project area, other land use activities in the area, and incorporation of the conservation measures recommended in this BA, it is concluded that implementation of the alternatives **might affect**, but is **not likely to adversely affect** the black-footed ferret.

8.2 Canada Lynx

Based on the lack of suitable habitat in the project area, it is unlikely that lynx would occur on the ARPA. Therefore, the alternatives would have **no effect** on the Canada lynx.

8.3 Preble's Meadow Jumping Mouse

Based upon the known distribution of the Preble's meadow jumping mouse, it is extremely unlikely that they would occur on the ARPA. Therefore, the alternatives would have **no effect** on the Preble's meadow jumping mouse.

8.4 Bald Eagle

Based upon the analyses of the alternatives, the current and potential status of the species in the project area, other land use activities in the area, and incorporation of the conservation

measures recommended in this BA, it is concluded that implementation of the alternatives **might affect**, but is **not likely to adversely affect** the bald eagle.

8.5 Wyoming Toad

Based upon the known and historic distribution of the Wyoming toad, it is extremely unlikely that it would occur on the ARPA. Therefore, the alternatives would have **no effect** on the Wyoming toad.

8.6 Blowout Penstemon

Based upon the analyses of the alternatives, the current status of these species, other land use activities in the area, and incorporation of the conservation measures recommended in this BA, it is concluded that implementation of the alternatives **might affect**, but is **not likely to adversely affect** blowout penstemon.

8.7 Ute Ladies'-Tresses

Based upon the analyses of the alternatives, the current status of these species, other land use activities in the area, and incorporation of the conservation measures recommended in this BA, it is concluded that implementation of the alternatives **might affect**, but is **not likely to adversely affect** Ute ladies'-tresses.

8.8 Colorado Butterfly Plant

Based upon the known distribution of the Colorado butterfly plant, it is extremely unlikely that it would occur on the ARPA. Therefore, the alternatives would have **no effect** upon the Colorado butterfly plant.

8.9 Colorado River Species

On July 5, 1994, the USFWS issued a biological opinion determining that the fee for depletions of 100 acre-feet or less would no longer be required. Impacts to the endangered fish species that are downstream of the ARPA in the Colorado River are expected to be less than 100 acre-feet per year, under the Proposed Action and any of the alternatives.

The Colorado pikeminnow, bonytail, humpback chub, and razorback sucker do not occur on the ARPA. However, the minimal water depletions to the Colorado River system that might occur would impact these species. Therefore, it is concluded that implementation of the Proposed Action and any alternatives is likely to adversely affect these fish species.

8.10 Platte River Species

The whooping crane, interior least tern, piping plover, Eskimo curlew, pallid sturgeon, and western prairie fringed orchid do not occur on the ARPA and no water depletions to the Platte River system would occur. Therefore, it is concluded that implementation of the Proposed Action and any of the alternatives would have **no effect** upon these species.

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Appendix H

Required Best Management Practices

APPENDIX H

REQUIRED BEST MANAGEMENT PRACTICES

Consolidated Table

These Best Management Practices (BMPs) will be applied under all alternatives as Conditions of Approval where proposals conflict with identified resources.

Additional mitigation measures are also identified in:

- Appendix K, Applicant Voluntary Committed Measures
- Appendix B, Reclamation Plan,
- Appendix E, Wildlife Monitoring/Protection Plan
- Appendix J, Best Management Practices for Reducing Non-Point Source Pollution

Best Management Practices and mitigation measures are further described in:

- Draft Rawlins Resource Management Plan
- BLM/Forest Service *Surface Operating Standards for Oil & Gas Exploration and Development* (“Gold Book”) (<http://www.blm.gov/bmp/gold%20book/FinalGoldBook%20-%202006%204th%20Edition.pdf>)
- BLM’s “Best management Practices Web page: (http://www.blm.gov/bmp/Technical_Information.htm)
- BLM Manual 9113—Roads

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Paleontology Resources		
Paleontology Resources	<p>1) Each proposed facility located in areas with known and/or potential significant paleontological resources (Paleontology Condition 1 and 2 areas and Probable Fossil Yield Class 4 and 5 areas) would be surveyed by a BLM-approved paleontologist prior to surface disturbance.</p> <p>2) Any significant fossils or localities previously known or discovered during the survey will be avoided by the permitted activity, or fully mitigated prior to allowing the activity to proceed.</p> <p>3) If paleontological resources are discovered at any time during construction, all construction activities would halt and BLM personnel would be immediately notified. Work would not proceed until paleontological materials are properly evaluated by a qualified paleontologist. In addition, the site would be protected from further damage or looting.</p>	(USDI-BLM 1987, 1990)
Cultural Resources		
Cultural Sites Eligible Under Criterion D—Physical Site Locations - Including Trails	<p>1) Avoidance</p> <p>2) Data Recovery</p>	Wyoming State Protocol— Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800 Criteria for Eligibility are found in 36 CFR 60.4

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
<p>Cultural Sites Where Setting Contributes to Eligibility</p>	<p style="text-align: center;">Cultural Resources</p> <ol style="list-style-type: none"> 1) Collocate roads and pipelines 2) Brush hog rights-of-way where feasible 3) No surface disturbance within a quarter mile of the trails or visual horizon whichever is closer. 4) Use low-profile facilities. 5) Paint all surface facilities a color compatible with local environment 6) Surface all roads with material compatible in color with the local environment. 	<p>Wyoming State Protocol— Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800</p> <p>Criteria for Eligibility are found in 36 CFR 60.4; Special measures are considered within 2 miles either side of the entire trail corridor, since viewsheds of contributing segments may be affected even if a project is located immediately adjacent to a non-contributing portion.</p>
<p>Native American Sensitive Sites/Traditional Cultural Properties (TCP) (Native American Consultation is the first step to identify important mitigation measures to be considered.)</p>	<p style="text-align: center;">Determined on a case-by-case basis</p>	<p>Numerous laws and directives including: Native American Graves Protection and Repatriation Act of 1990 (NAGPRA); American Indian Religious Freedom Act of 1978 (AIRFA); Executive Order 13007</p> <p>Native American sensitive sites may or may not be eligible for the National Register. Mitigation measures are considered on a site specific basis.</p>

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
	Fluid Minerals	
SMA's Water Resources, Visual Resources, Wildlife, Vegetation, Fisheries	<p>1) Require transportation planning map in a GIS compatible format with all operator coordination and input, to minimize duplication of roads, compressor stations, pipelines and other facilities.</p> <p>1) Directional drilling 2) Drill multiple wells from a single pad 3) Transportation planning (to reduce road density and traffic volumes) 4) Remote well monitoring 5) Pipe produced liquids to centralized tank batteries off-site to reduce traffic to individual wells 6) Submersible pumps 7) Below ground well heads 8) Bus workers to reduce traffic volume 9) Flareless well completions 10) Bury distribution power lines and flowlines in or adjacent to access roads. 11) Design and construction of all new roads to a safe and appropriate standard, "no higher than necessary," to accommodate their intended use 12) Reuse of old roads or pads 13) Interim reclamation of well locations and access roads soon after well is put into production, as described in the Reclamation Plan, appendix B. 14) Avoid facility placement on steep slopes, ridge tops, and hill tops. 15) All production facilities installed on location that have the potential to leak or spill oil, glycol, produced water, or other fluid, shall be placed within an appropriate containment or diversionary structure. 16) On-site bio-remediation of oil field wastes and spills 17) Remove trash, junk, waste and other materials not in current use. 18) All existing and proposed roads shall be brought up to BLM minimum standards as found in BLM Manual 9113.</p>	
Reducing Impacts from Fluid Mineral Construction, Operation, and Reclamation		BMPs; Reclamation Plan- appendix B

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Reclamation Plan		
<p>Appendix B–Reclamation Plan (Control and minimize surface runoff, erosion, and sedimentation; invasive weed control; native vegetation and habitat protection/restoration; visual resource management.)</p>	<p>1) See appendix B, Reclamation Plan, for complete, specific reclamation guidance</p>	
Vegetation Resources		
<p>Aspen, Juniper Woodland, Serviceberry, Mountain Mahogany, Silver Sagebrush/Bitterbrush Vegetation Communities.</p>	<p>1) Avoidance areas. Plans should be submitted and approved by BLM for surface disturbance in these areas. Only those areas that cannot be avoided could be approved.</p>	<p>Plant communities which failed to meet Rangeland Health Standard #3 in 2001 assessment. These communities are high value, low occurrence, and present reclamation difficulties</p>
<p>Control of Invasive Weeds</p>	<p>1) Weeds shall be controlled on project disturbed areas and native areas infested as a direct result of the project. The control methods shall be in accordance with guidelines established by the USEPA, BLM, state and local authorities. Prior to the use of pesticides, the operator will obtain written approval from the BLM Authorized Officer (meaning an approved pesticide use proposal form).</p>	<p>Wyoming Weed and Pest Control Act, 1973 & Wyoming Weed and Pest Special Management Program, Title 11, Chapter 5. Executive Order 13112</p>
<p>Protection of Study Areas</p>	<p>1) Avoid any disturbance to monitoring sites.</p>	<p>Rangeland Health Standards, 43 CFR 4180.1</p>

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
<p style="text-align: center;">Visual Resource Management</p> <p>VRM Management Class III Areas Visible from State, County and BLM Roads in Viewshed</p>	<ol style="list-style-type: none"> 1) Gravel of road surfacing shall be similar color to adjacent dominant soil colors. 2) Avoid locating pads in areas visible from primary roads. 3) Avoid locating facilities on or near ridgelines - use subsurface or low-profile facilities to prevent protrusion above horizon line when viewed from any primary road. 4) Avoid routing well access roads directly from state, county, or BLM roads. 5) Co-locate wells when possible. 6) Locate facilities far enough from the cut and fill slopes to facilitate re-contouring for interim reclamation. 7) Do not locate wells adjacent to prominent features such as rock outcrops. 8) Repeat elements of form, line, color, and texture to blend facilities and access roads with the surrounding landscape 9) Complete annual transportation plan for entire area before beginning construction - make layout that will minimize disturbance and visual impact. 10) Design and construct all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use. 11) Locate roads far enough off the back of ridgelines so they aren't visible from state, county or BLM roads. 12) Use remote monitoring to reduce traffic and road requirements. 13) Remove unused equipment, trash and junk immediately. 14) Reclaim unnecessary access roads as soon as possible. 15) All above-ground structures, production equipment, tanks, transformers, insulators, not subject to safety requirements shall be painted to blend with the natural color of the landscape. The paint used shall be a non-reflective "Standard Environmental Color" approved by the BLM VRM specialist. 	<p>VRM BMPs for Fluid Minerals, VRM H-8400-1, Land Use Planning H-1601-1</p>

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Visual Resource Management		
<p>Slopes < 5% in VRM Management Class III Areas Visible from State, County and BLM Roads (Minimizing road construction methods will reduce visual impacts by reducing vegetative removal and soil exposure.)</p>	<p>1) Do not create unnecessary cut and fill. Design and construct all new roads to a safe and appropriate standard, "no higher than necessary" to accommodate their intended use.</p>	<p>VRM BMPs for Fluid Minerals, VRM H-8400-1, Land Use Planning H-1601-1</p>
Water and Soil Management		
<p>Avoidance Areas</p>	<p>1) Avoidance areas for surface disturbing and disruptive activities and linear crossings include:</p> <ul style="list-style-type: none"> • Identified 100-year flood plains; • Areas within 500-feet from perennial waters, springs, wells and wetland riparian areas, and • Areas 100-feet from the inner gorge of ephemeral channels. 	<p>Wyoming Standard Mitigation Guidelines and Planning Decisions</p>
<p>Non-Point Source Pollution</p>	<p>See appendix J, Best Management Practices for Non-Point Source Pollution</p>	<p>Clean Water Act Section 303(e) and 40 CFR 130.5</p>

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
<p>Water Management Plan as Part of the Annual Work Plan Submittal in April</p>	<p>1) The Atlantic Rim operator responsible for new development around existing pods will submit a Water Management Plan as part of the Annual Work Plan submittal in April. This plan will have the following information:</p> <ul style="list-style-type: none"> • 12-digit HUC number and name • All digital and other information required by the Annual Workplan • Surface water assessment of current road network in the area including future plans for maintenance. • Average daily water production per well at current pod wells. • Average daily injection volumes of current injection wells, by well. • Unused injection well capacity • Estimated water production from proposed wells • Location, name and estimated capacity of new injection wells • Special Protection Measure for each well location, if applicable • Any water quality sampling results • Anticipated permit requirements, and copies of existing permits for water related activities required from ACOE, other federal agencies and/or the State of Wyoming. 	<p>Monitoring, planning and compliance for the success of the project</p>
<p>Surface Disturbance on Slopes >25% as Identified from the 30 meter DEM Data.</p>	<p>1) Plans should be submitted and approved by BLM for surface disturbance in these areas. Only those areas that cannot be avoided could be approved.</p>	<p>Wyoming Standard Mitigation Guidelines</p>

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Drainage Crossings	<p style="text-align: center;">Water and Soil Management</p> <ol style="list-style-type: none"> 1) Culverts or low-water crossings would be installed for all ephemeral and intermittent drainage crossings. All drainage crossing structures and culverts would be designed to pass at a minimum the 25-year discharge events, or as otherwise directed by the BLM. Downstream armoring will be installed when necessary. 2) The design of channel crossings will minimize changes in channel geometry and subsequent changes in flow hydraulics. Disturbed channel beds will be regraded to the original geometric configuration with the same or very similar bed material. Downstream armoring will be installed when necessary. 3) Construction of drainage crossings will be limited to no-flow periods or low-flow periods. 4) Channel crossings for buried pipelines will be constructed using trenching techniques such that the pipe is buried a minimum of four feet below the channel bottom. To stabilize stream banks, appropriate size riprap will be placed from the channel bottom to the top of the normal high water line at all stream crossings. When excavating the crossing separate the top one-foot of stream bottom substrate from deeper soil layers and reconstruct the original layers by replacing deeper substrate first. 	Wyoming Standard Mitigation Guidelines

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Reducing Surface Runoff and Erosion	<p>1) Adequate drainage control devices and measures would be included in the road design and maintenance (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipaters) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid concentrated flows.</p> <p>2) Locations for these features will be proposed in Annual APD approval master plans submitted by the operator and will be identified specifically in construction plans after BLM on-sites.</p> <p>3) Erosion control devices would also be used in conjunction with the surface runoff and drainage control devices, such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. A revegetation program would be implemented as soon as possible to re-establish the soil protection afforded by a vegetal cover.</p> <p>4) When an existing road, improved for travel, will reduce environmental impacts compared with a new route, it will be used and identified during annual planning and onsite inspections.</p>	Wyoming Standard Mitigation Guidelines
Road and Pad Drainage and Erosion Mitigation	<p>1) Culverts should be installed in road crossings for small ephemeral channels. All drainage and erosion mitigation should be designed for at least the 25 year discharge events, and use at minimum 18 inch culverts (with armored entrances and exits as necessary). Waterbars, waddles or haybales, and silt fences can be used as needed to reduce surface runoff velocity and deposit sediment in the uplands to protect riparian areas, wetlands and surface waters.</p>	(USDI-BLM and USDA 2006)
Well Inventories Water developments Associated with Groundwater	<p>1) All potentially affected landowners having properly permitted water wells with the Wyoming State Engineer's Office within each proposed well's circle of influence (1/2 mile radius) were offered a Water Well Agreement; and if a water well agreement is not reached with the landowner, the responsible Atlantic Rim Operator will mitigate the impacts in accordance with State of Wyoming water laws. Some examples of mitigation would be drilling an additional supply well or provide CBNG water as an offset.</p>	Potential Impact Mitigation— Note that this is situation is very unlikely to occur, but important to address if it does occur.

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Interim Reclamation of Unused Areas.	<p>1) Completely reclaim all disturbed areas not needed for production activities including:</p> <ul style="list-style-type: none"> • Pipeline ROW, • Portion of road ROW not needed in the function of the road, and • The portion of the drill pad not needed during production. <p>Reclamation would generally include:</p> <ul style="list-style-type: none"> • complete cleanup of the disturbed areas; • The topography would be restored to contours that existed prior to construction; • Ripping of disturbed areas to a depth of 12 to 18 inches; • Topsoil or suitable plant growth material would be replaced over all disturbed surfaces; • Seeding of reclaimed areas with the seed mixture prescribed in the Surface Use Plan or Plan of Development for the proposed Action, and • Mulching or soil amendments, if considered necessary by the BLM officer. 	Reduce long-term disturbance by improving reclamation success.

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Water Used for Construction, Maintenance, and Drilling Activities	<ol style="list-style-type: none"> 1) All water used for drilling, completion and testing activities will come from existing CBNG wells or re-used from other drilling sites, subject to state permitting. 2) All water used for construction, dust abatement or hydrostatic testing will come from existing CBNG wells or sources with sufficient quantities and through appropriation permits approved by the State of Wyoming. Surface water and shallow groundwater sources would only be located in the Colorado River Basin and has been consulted on with the Fish and Wildlife Service (See appendix G, Biological Assessment). Under no circumstances are these methods to be used for water disposal, only volumes appropriate for the use would be approved. 3) Hydrostatic test water will be discharged in a controlled manner onto an energy dissipater and within existing ROWs. The water is to be discharged onto undisturbed land that has vegetative cover and with energy dissipation such as using a rock armored apron or gated pipe. Prior to discharge, water should be tested and treated or filtered if necessary to reduce pollutant levels or to settle out suspended particles if necessary. Coordinate all discharge to test water with the SEO, WDEQ and the BLM. 	CBNG water is generally of good enough water quality in this area to be used for these purposes. Waters from the producing coal seams has been shown to be geographically isolated from most water sources (See section 4.4). These are proper beneficial uses with the State's approval that would not change impacts if used in volumes commiserate with the water needs. These methods are not intended to help with water disposal needs for the project, since they are generally of such low volumes
Range Management		
Range Improvements	<ol style="list-style-type: none"> 1) Employ prevention measures to avoid damaging fences, gates, and cattleguards. 2) Report and correct any damage that occurs to rangeland improvement projects. 3) Prior to drilling, upgrade cattleguards and gates width and load bearing requirements to meet BLM Road Standards (BLM Manual 9113). 	Protect function and value of range improvements
Reduce Danger to Livestock from Potential Hazardous Wastes	<ol style="list-style-type: none"> 1) For the protection of livestock, all pits and open cellars shall be fenced. Fencing shall be in accordance with BLM specifications. 	

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Wildlife		
Appendix F Wildlife Monitoring/Protection Plan Wildlife Monitoring/Protection	For complete list of wildlife protection measures (See appendix E)	
Big Game Crucial Winter Range	<ol style="list-style-type: none"> 1) Directional drilling 2) Drill multiple wells from a single pad 3) Remote well monitoring 4) Transportation planning (to reduce road density and traffic volumes) 5) Cluster development 6) Compensation mitigation 7) Seasonal restriction of public vehicular access. 	BMP's
Greater Sage-Grouse and Columbian Sharp-Tailed Grouse Habitat	<ol style="list-style-type: none"> 1) Directional drilling 2) Drilling of multiple wells from a single pad 3) Seasonal restriction of public vehicular access 4) Noise reduction techniques and designs 5) Use of low profile well facilities and tanks 6) Burying of power lines to avoid use of poles and other tall structures 7) Transportation planning to align roads out of sight and sound of leks, and to schedule traffic to avoid greater sage-grouse and Columbian sharp-tailed grouse activity periods 8) Design of roads to minimum safe standard for intended use 9) Partial reclamation of resource roads needed for project construction to lower standards necessary for maintenance operations 	BMP's
Wildlife Habitat	<ol style="list-style-type: none"> 1) Seasonal restriction of public vehicular access 2) Implementation of the Wyoming Bird Conservation Plan from Wyoming Partners in Flight. 	BMP's

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Wildlife		
Potential Hazards to Wildlife	<p>1) For the protection of wildlife, all pits and open cellars shall be fenced. Fencing shall be in accordance with BLM specifications. Netting shall be placed over all open production pits to eliminate any hazard to migratory birds or other wildlife. Netting is also required over reserve pits which have been identified as containing oil or hazardous substances (CERCLA Section 101(14)) as determined by visual observation or testing. The mesh diameter shall be no larger than one inch.</p> <p>2) Cover vent pipes to prevent bats or small birds from being trapped.</p>	
Atlantic Rim Mule Deer Study, Game & Fish Data Disruption of Mule Deer Migration Corridors.	<p>1) NSO narrow migration corridor (to be determined following data collection and analysis from Mule Deer Study).</p> <p>2) Avoid surface disturbance within identified migration corridors.</p>	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004)
Reduce Incidental Loss of Wildlife	<p>1) Inform all project employees of applicable wildlife laws and penalties associated with unlawful take and harassment.</p> <p>2) Require that regular drivers undergo training describing the types of wildlife in the area that are susceptible to vehicular collisions, the circumstances under which such collisions are likely to occur, and the measures that can be employed to minimize them.</p>	
Disturbance of Severe Winter Relief Habitats for Greater Sage-Grouse and Columbian Sharp-Tailed Grouse.	<p>1) Avoidance</p>	Vegetation and Habitat Analysis of Critical Wintering Areas for Greater Sage-Grouse (HWA 2004)

APPENDIX H. REQUIRED BEST MANAGEMENT PRACTICES

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Wildlife		
Human presence	<ol style="list-style-type: none"> 1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be gated. 2) Remote monitoring of well locations would be required where feasible. 	<p>Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA. Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.</p>

Notes:

- ACOE – U.S. Army Corps of Engineers
- APD – Application for Permit to Drill
- AIRFA – American Indian Religious Freedom Act of 1978
- BLM – Bureau of Land Management
- BMP – Best Management Practices
- CBNG – coal bed natural gas
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
- CFR – Code of Federal Regulations
- DEM – digital elevation model
- GIS – geographic information system
- HUC – hydrologic unit code
- HWA – Hayden-Wing Associates
- NAGPRA – Native American Graves Protection and Repatriation Act of 1990
- NHPA – National Historic Preservation Act
- ROW – right-of-way
- SEO – State Engineer's Office
- SMA – Special Management Area
- TCP – Traditional Cultural Properties
- USDA – United States Department of Agriculture
- USDI-BLM – United States Department of the Interior-Bureau of Land Management

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USEPA – United States Environmental Protection Agency
VRM – Visual Resource Management
WDEQ – Wyoming Department of Environmental Quality
WGFD – Wyoming Game and Fish Department

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- HWA 2004. *Vegetation and Habitat Analysis of Critical Wintering Areas for Greater Sage-Grouse. Final Report.* Laramie, Wyoming: Hayden-Wing Associates. 45 pp.
- USDI-BLM 1987. *Muddy Creek Watershed Plan, Divide Resource Area, Rawlins, Wyoming.* U.S. Department of Interior, Bureau of Land Management.
- USDI-BLM 1990. *Great Divide Resource Area Record of Decision and Approved Resource Management Plan.* Rawlins, Wyoming: U.S. Department of the Interior, Bureau of Land Management, Rawlins District Office, Great Divide Resource Area. 74pp.
- USDI-BLM and USDA. 2006. *Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development.* BLM/WO/ST-06/021+3071. Denver, Colorado: Bureau of Land Management. 84 pp.
- WGFD 2004. *Minimum Programmatic Standards Recommended by the Wyoming Game and Fish Department to Sustain Wildlife Habitats Affected by Oil and Gas Development.* Cheyenne, Wyoming: Wyoming Game and Fish Department.

Appendix I

Cultural Resources Management

APPENDIX I

CULTURAL RESOURCES MANAGEMENT

Program Objectives

The Bureau of Land Management (BLM) has developed a cultural resources program designed to inventory, evaluate, and manage cultural resources on BLM-administered public land and in areas of BLM responsibility. The BLM management of cultural resources (archaeological, historic, and socio-cultural properties) is in accordance with the provisions of the National Historic Preservation Act (NHPA) of 1966, as amended and other applicable legislation.

Identification of Cultural Resources

The BLM requires cultural resource inventories for actions with federal responsibility that include surface disturbance as a part of the action. The purpose of inventories is to identify cultural resources prior to any ground disturbing activity. This way, sites can be protected through project redesign or other mitigation measures prior to any threat of disturbance. Numerous laws and regulations mandate this policy. For a brief overview of selected laws and policies dictating BLMs treatment of cultural resources, please see the end of this appendix.

Three classes of cultural resource inventory have been established; Class III is the most intensive.

Class I inventories are completed with the use of existing data from cultural resource inventory files maintained by both the BLM and the Wyoming State Historic Preservation Office (SHPO). Class I inventories are conducted at two different levels: at the planning stage of an environmental impact statement (EIS) to produce a regional overview; and at the site-specific level for individual proposed projects to determine if previous cultural resource inventories have been conducted within the area of potential effect (APE). The purpose of Class I inventories are to provide cultural resource specialists and managers with an informed basis for understanding the nature of the archaeological record within the area in question.

Class II inventories are statistically based sample surveys designed to aid in characterizing the probable density, diversity, and distribution of cultural properties in the area, to develop and test predictive models, and to answer appropriate research questions. Within individual sample units, survey aims, methods, and intensity are the same as those applied in Class III survey. Class II survey may be conducted in several phases, using different sample designs, to improve statistical reliability.

Class III intensive field surveys are conducted by professionals through pedestrian survey of an entire target area. The intent of a Class III inventory is to locate and record all historic properties and is consistent with standards in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716). Class III inventories conform to the prevailing professional survey standards for the region involved, provided that the regional standards meet or exceed the Secretary's Standards and Guidelines. Because Class III survey is designed to produce a total inventory of the cultural properties observable within the target area, once it has been completed no further survey work should be needed in the target area as long as the current standards are met. Areas with a high probability of

APPENDIX I. CULTURAL RESOURCES MANAGEMENT

containing buried cultural materials or known cultural materials may require additional work of professional monitoring and/or data recovery excavations. Areas that require additional work are analyzed on a case-by-case basis, depending on the proposed action and the types of cultural resources present in the project area.

BLM Jurisdiction on Privately Owned and/or Split Estate Lands (Including the Checkerboard Land Pattern)

Survey

The BLM frequently authorizes permits and rights-of-way, or provides approvals for actions on federal lands in which portions of the overall project may take place on non-federal lands or the federal action may have contingent or cumulative effects on non-federal lands. Before the BLM can authorize (through permit, license, etc.) any project which may adversely affect significant cultural resources (i.e., historic properties), the BLM has the legal responsibility to take into account the effects of its actions on these resources. In order for the BLM to fully consider the effects of its actions, it also has the responsibility to gather the information necessary to know what cultural resources may be affected, evaluate the resources for eligibility for inclusion in the National Register of Historic Places, and mitigate adverse affects to historic properties where possible.

If a project requires the use of federally owned surface lands as well as privately owned surface lands, there are two authorities that require federal agencies to apply the same NHPA Section 106 compliance standards to private lands as they do to federal lands. The regulations at 36 CFR, Part 800.4(b) require the federal agency to "take the steps necessary to identify historic properties within the area of potential effect." That this includes both federal and nonfederal lands is implicit throughout the statute and the regulations, since the regulatory definition of "area of potential effect" is "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties" [36 CFR, Part 800.16(d)]. It makes no distinction between federal and nonfederal lands. More explicit, however, is Executive Order No. 11593, entitled "Protection and Enhancement of the Cultural Environment." Under the EO, Section 1(3) it states that all federal agencies: "...in consultation with the Advisory Council on Historic Preservation, institute procedures to assure that federal plans and programs contribute to the preservation and enhancement of *non-federally owned* sites, structures and objects of historical, architectural, or archaeological significance." The BLM's responsibility for inventory, evaluation, and protection of cultural properties on lands outside BLM administrative jurisdiction is limited according to the degree to which the Field Manager's decisions determine or control the location of surface-disturbing activities on those lands.

BLM makes this policy known to project proponents, who in turn are responsible for providing all of the information the BLM requires for making informed decisions. If cultural resource data is lacking from private lands so that the BLM authorized officer cannot make an informed decision, the BLM cannot allow the undertaking to proceed. Thus, it is the responsibility of the project proponent to acquire the appropriate information.

Within the checkerboard land pattern that encompasses much of the planning area, Wyoming BLM has set forth the policy that the entire project area, if it covers any federal lands, must be inventoried. The reasoning for this is that the distances between federal ownership and private

APPENDIX I. CULTURAL RESOURCES MANAGEMENT

ownership are so short, that the potential for the federal portion to not dictate the placement of the project on private is remote.

Split estate lands are defined as those lands where surface ownership transferred to private landowners from the federal government but the mineral rights were retained by the federal government. These situations arose either through patent under the 1914 amendment to the Homestead Act or purchase under the Stock-raising Act of 1916. Each of these Acts also allowed for the federal government to "reenter and occupy so much of the surface...as may be required for all purposes reasonably incident to the mining or removal of coal or other minerals." At the time of purchase, the buyer agreed to these terms. Since completing compliance of the NHPA Section 106 process is required of a federal agency by statute and regulation prior to the federal action, and then being able to complete that process is a purpose reasonably incident to the extraction of the minerals.

Site Management

As stated above, BLM has multiple authorities for requiring cultural resource inventories on private lands. This jurisdiction only holds forth with federal undertakings. Cultural resources that are located on private lands are recorded for the permanent record and appropriate mitigation measures are applied, in consultation with the private landowner. This jurisdiction comes from the requirement that the federal agency must take into account its effects on all historic properties. Once the federal undertaking has been fully processed, the federal responsibility for an historic property is completed. The historic property remains under the ownership of the landowner, thus BLM has no control over the historic property outside of the venue of a federal undertaking.

Evaluation of Cultural Resource Sites

Criterion for Eligibility

The BLM evaluates the significance of cultural resources identified during inventory in consultation with the Wyoming SHPO to determine if the resources are eligible for inclusion in the National Register of Historic Places (NRHP). Cultural resource properties may be considered eligible for listing in the National Register if they meet one or more of the following criteria identified in 36 CFR 60.4:

- **Criterion A.** An historic property is associated with an event or events that have made a significant contribution to the broad patterns of America's History.
- **Criterion B.** An historic property is associated with the lives of persons significant to our past.
- **Criterion C.** An historic property embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic value or represents a significant and distinguishable entity whose components may lack individual distinction.
- **Criterion D:** An historic property has yielded or may be likely to yield information important in prehistory or history.

APPENDIX I. CULTURAL RESOURCES MANAGEMENT

To facilitate evaluation of cultural resource values in Wyoming, the BLM has devised guidelines for determining the eligibility of archaeological and historical sites and historic trails (BLM Manual 8110.32). The guidelines supplement the National Register criteria for evaluation (36 CFR 60.4) and provide consistency across all BLM jurisdictions. Application of the guidelines ensures that significant cultural resources are recognized and managed accordingly.

Aspects of Integrity

Integrity is the ability of a property to convey its significance. To be listed in the National Register of Historic Places, a property must not only be shown to be significant under the National Register criteria, but it also must have integrity. The evaluation of integrity is sometimes a subjective judgment, but it must always be grounded in an understanding of a property's physical features and how they relate to its significance.

Historic properties either retain integrity (this is, convey their significance) or they do not. Within the concept of integrity, the National Register criteria recognizes seven aspects or qualities that, in various combinations, define integrity.

To retain historic integrity a property will always possess several, and usually most, of the aspects. The retention of specific aspects of integrity is paramount for a property to convey its significance. Determining which of these aspects are most important to a particular property requires knowing why, where, and when the property is significant.

- **Location.** The place where the historic property was constructed or the place where the historic event occurred.
- **Design.** The combination of elements that create the form, plan, space, structure, and style of a property.
- **Setting.** The physical environment of an historic property.
- **Materials.** The physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form an historic property.
- **Workmanship.** The physical evidence of the crafts of a particular culture or people during any given period in history or prehistory.
- **Feeling.** The property's expression of the aesthetic or historic sense of a particular period of time.
- **Association.** The direct link between an important historic event or person and an historic property.

Contributing and Non-Contributing to NRHP Eligibility

Properties that encompass large areas can be deemed to have contributing and non-contributing portions. Contributing portions are seen to retain integrity of the values for which the property is considered eligible for the NRHP. Non-contributing portions are identified portions of the property which are not deemed to retain the integrity of values which would

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render the property eligible for the NRHP. The determination of contributing versus non-contributing portions of an eligible property can be made at any time after adequate evaluation has been conducted.

Historic trails including the Overland and Cherokee, the Rawlins to Fort Washakie Freight Road, and the Rawlins to Baggs Freight Road, are considered eligible for the National Register under Criterion A. However, some portions of the trails no longer retain the aspects of integrity necessary for eligibility. As there have been no encompassing inventories of entire trails within the Resource Management Plan Planning Area (RMPPA), portions of trails are evaluated to determine if they contribute to the eligibility of the property on a case-by-case basis. Trail segments are evaluated pursuant to the National Register criteria of integrity (location, design, setting, materials, workmanship, feeling, and association). If a predominance of criteria are met, the segment will be considered contributing to the properties' overall NRHP eligibility.

BLM Use Allocations

After determination of eligibility, significant cultural resource properties are further evaluated for assignment to one or more use categories. The BLM has established six use categories as follows:

1. **Scientific Use.** This category applies to any cultural property determined to be available for scientific or historical study using currently available research techniques, including methods that would result in the property's physical alteration or destruction. Recommendations to allocate individual properties to this use must be based on documentation of the kinds of data the property is thought to contain and the data's importance for pursuing specified research topics.
2. **Conservation for Future Use.** A cultural property included in this category is deemed worthy of segregation from all other land or resource uses, including cultural resource uses, which threaten the maintenance of its present condition or setting, and will remain in this use category until specified provisions are met in the future.
3. **Traditional Use.** This category is to be applied to any cultural resource known to be perceived by a specified social and/or cultural group as important in maintaining the cultural identity, heritage, or well being of the group. Cultural properties assigned to this category are to be managed in ways that recognize the importance ascribed to them and seek to accommodate their continuing traditional use.
4. **Public Use.** This category may be applied to a cultural property found to be appropriate for use as an interpretive exhibit in place, or for related educational and recreational uses by members of the general public.
5. **Experimental Use.** This category may be applied to a cultural property judged well-suited for controlled experimental study, to be conducted by BLM or others, concerned with the techniques of managing cultural properties, which would result in the property's alteration, possibly including loss of integrity and destruction of physical elements. It should not be applied to cultural properties with strong research potential, traditional cultural importance, or good public use potential, if it would significantly diminish those uses.

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- 6. Discharged from Management.** This category is assigned to cultural properties that have no remaining, identifiable use. Most often these are prehistoric and historic archaeological properties, such as small surface scatters of artifacts or debris, whose limited research potential is effectively exhausted as soon as they have been documented. Properties discharged from management remain in the inventory, but they are removed from further management attention and do not constrain other land uses.

When a cultural resource property is assigned to one or more use categories, a decision is made pertaining to the management of that property. The criteria and guidelines for the evaluation of cultural resources and the assignment of significant cultural resource properties to specific use categories would remain unchanged under all the alternatives addressed in this plan.

Determinations of Effect

Once the eligibility of an historic property has been determined, the BLM must then determine the effects a proposed undertaking may have on a cultural resource. Standard measures for reducing effects are to be considered part of the project design. Determination of effect must be made after standard treatment measures and best management practices (BMP) been integrated into the project design. The final project design must incorporate all agreed upon treatment measures and be included in the Conditions of Approval or components of the Surface Use Plan, Plan of Operations, or Plan of Development.

No Historic Properties Affected. If no cultural resource sites eligible for listing in the NRHP are present in the proposed project area, there are historic properties present but the undertaking will have no effect upon them, or a proposed project will not be visible from an historic property or there is no contrast between the project and the setting, the BLM will find that the undertaking has no potential to affect historic properties.

No Historic Properties Adversely Affected. If a proposed project will cause effects to an historic property, but the effects will not diminish the aspects of integrity nor the characteristics that make the property eligible for listing in the National Register of Historic Places, only non-contributing portions of historic properties will be affected, or if setting is an important aspect of integrity for a historic property and the project will cause a weak contrast, the BLM will find that the undertaking has no potential to adversely affect historic properties.

Historic Properties Adversely Affected. An adverse effect is found when an undertaking may alter, directly, or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the national Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects cause by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

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Consultation

SHPO Consultation

According to the Programmatic Agreement between the Advisory Council on Historic Preservation (ACHP) and the BLM, the BLM is required to consult with the Wyoming SHPO on eligibility and effects to each cultural property. The Wyoming BLM and Wyoming SHPO have developed a Protocol for consultation that serves to streamline the process and reduce consultation time frames from the guidelines set forth in the 36 CFR 800 regulations. Under the Protocol between the Wyoming BLM and the Wyoming SHPO, those sites recommended as eligible for listing under Criteria A, B, or C or the setting is an important aspect of integrity requires case-by-case consultation with the Wyoming SHPO. Additionally, the BLM has implied concurrence for determining eligibility and effects for sites eligible for listing under Criterion D of the NHPA. Determination of effects to sites follows the criteria outlined in 36 CFR 800.5.

Native American Consultation

In addition to consultation with the Wyoming SHPO office, the BLM conducts Native American Consultation in compliance with Section 106 of the NHPA, the American Indian Religious Freedom Act of 1978, and Executive Order No. 13007. The BLM has created a process for conducting Native American consultation for federal undertakings, as described in BLM Manual 8120 and BLM Manual H-8120-1. The BLM has worked extensively with tribes known to inhabit the region to establish a protocol for consultation. Consultation with Native American tribes occurs during the planning process of environmental impact statements and when individual projects are proposed that may impact properties that have traditional use (i.e., Traditional Cultural Properties [TCPs]) or are sacred to Native American cultures. When one of these site types are identified within proximity to a proposed undertaking, the project proponent and tribal governments are notified. Determinations of eligibility and effects the project may have on the site are determined in consultation with tribal representatives. The BLM does not authorize any undertaking that has the potential to affect TCPs or Native American Sacred Sites without first consulting with tribes. The likelihood of inadvertently affecting a TCP or sacred site is low because of the established protocols BLM has developed with tribal representatives.

Interested Parties

The BLM will solicit such input through the public participation opportunities afforded by BLM's land use planning and environmental review processes established under the National Environmental Policy Act (NEPA) of 1969 and the Federal Land Policy and Management Act (FLPMA) of 1976, and in accordance with regulations at 43 CFR Part 1610.3. Interested parties shall be invited to participate in the Section 106 consultation process if they have a demonstrated interest in a BLM undertaking or action on historic properties. Such interested parties may include, but are not limited to, local governments, grantees, permittees, owners of affected lands or land surfaces, Indian tribes, and other interested parties determined jointly by BLM and SHPO.

In making determinations of effect, BLM may request comments of interested parties. When BLM makes a determination of adverse effect, they will request comments of interested parties. BLM will maintain lists of interested parties based on their identified interests.

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BLM and SHPO will consult to identify invited concurring parties based on their demonstrated interest and level of participation. Invited concurring parties will be provided the opportunity to sign a Memorandum of Agreement or Programmatic Agreement. Refusal by an invited concurring party to sign an agreement will not invalidate the agreement.

Management of Cultural Resources

Management objectives for significant cultural resource values provide a direct link between the assignment of properties to use categories and the achievement of the cultural resource program objectives. The basic management objectives for significant cultural resource values would remain unchanged under all of the alternatives addressed in this plan.

Specific management actions that could be taken to achieve these objectives at selected significant properties are described in the discussions of the various alternatives. Management objectives for significant properties that have not yet been identified or for which inventory data are insufficient as of this writing will remain unchanged, but management actions for these properties will be prescribed on a case by case basis and will be addressed in amendments to this plan when appropriate.

Standard Protective Measures

Within the framework described above, the BLM has developed protective measures to minimize adverse effects (as defined in 36 CFR 800.5[1]) on significant cultural resource values. Protective measures are used in response to the proposed actions of BLM programs involving surface disturbance. These measures include cultural resource inventories, evaluation of cultural resources located during inventory, setting assessments where applicable, best management practices and mitigation of potential adverse impacts on significant cultural resources.

A setting assessment is used to determine what physical features of a proposed undertaking will be visible from a historic property for which setting is an important aspect of integrity. Visibility of undertakings will vary. The scale of visual analysis should be commensurate with the scale of the undertaking. In the majority of cases, undertakings will not be seen beyond three miles; pipelines, fiber-optic and other ground level disturbance will not likely be seen beyond a mile. In rare cases, undertakings may be seen beyond five miles if they are unusually large or are skylined on the horizon, such as wind turbines and communication towers.

A setting assessment can also be used to determine whether a proposed undertaking will introduce audible elements to the historic property where setting is an important aspect of integrity. These proposed undertakings may include compressor stations, pumping stations, or wind turbines. An assessment of the existing audible elements will be documented and then the BLM archaeologist will work with the project proponent to ensure new audible elements do not result in an adverse effect. Best management practices and mitigation measures will be utilized to achieve this goal.

Best Management Practices

In situations where a proposed undertaking has the potential to affect the physical integrity of an historic property, there are numerous measures that can be applied to reduce or eliminate the effects. BLM archaeologists work with the contracting archaeologist and the project proponent

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to determine which practice would best suit the needs of all parties. Application of BMPs is dependent upon the nature of the undertaking, and the nature of the historic property.

Avoidance. Avoidance, through modification of the proposed undertaking, is the primary and preferred measure used to protect cultural resources. This can be accomplished at the project planning stage.

Monitoring. In situations where avoidance of adverse affects is not feasible, or there is a determination of no adverse effects, but the potential remains for there to be adverse effects through inadvertent discovery, a BLM permitted archaeologist will monitor construction activities. The presence of a monitor is to ensure that buried cultural materials are immediately identified and that construction activities in that area are halted to avoid further impacts to the site. Prior to BLM authorization of the project, the project proponent submits a discovery plan to the BLM for review which outlines the way in which cultural resources will be treated and the responsibilities of the project proponent. This plan is reviewed by BLM archaeologists and submitted to SHPO for concurrence. In the case where monitoring results in a discovery situation, the discovery plan is enacted. Depending on the nature of the discovery the project may be allowed to proceed, redesigned, or data recovery may be required.

Standard Measures to Reduce Visual Contrast. When a proposed project is found to be within the contributing setting of an historic property, an assessment of potential impacts is conducted through viewshed analyses, on-site inspection, and photo inspection. For historic trails such as the Cherokee Trail, Overland Trail, Rawlins to Fort Washakie Road and Rawlins to Baggs Road, protection measures would be carried out similarly to other historic properties if any project were found to be located within a quarter mile of a contributing portion of the historic trail. When a proposed project is outside of the a quarter mile buffer of the trail, but found to be within the viewshed that contributes to NRHP eligibility, analyses of potential impacts to the integrity of the setting would be carried out in the same way as other properties where setting is an aspect of integrity. Best management practices used to ensure that the contributing viewshed of historic properties are not adversely affected include:

- Consolidating project facilities among oil and gas developers—this also facilitates cumulative analysis.
- Develop coordinated road and pipeline systems.
- Reduce the amount of surface development by consolidating facilities (e.g., develop bottom hole wells using directional drilling from a single surface well location).
- Use low profile facilities.
- Proper sighting and location to maximize the use of topography and vegetation to screen development. Design projects to blend with topographic forms and existing vegetation patterns.
- Use environmental coloration or advance camouflage techniques to break up visual intrusion of facilities that cannot be completely hidden.

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- Use broken linear patterns for road developments to screen roads as much as possible. This can include feathering or blending of the edges of linear rights-of-way to break up the linearity.
- For livestock control, use electric fencing with low-visibility fiberglass posts and environmental colors (e.g., sage green).
- Design linear facilities and seismic lines to run parallel to key observation points rather than perpendicular.
- Modify the orientation of facilities to present less of a visual impact (e.g., a facility with several tanks lined up so that one obscures the visibility of the others).

Mitigation

Mitigation measures are determined by the types of proposed actions, the nature of the potential effect and the qualities of the historic property that render it eligible for NRHP listing. Mitigation measures are applied when best management practices will not reduce or minimize adverse effects. Mitigation may include data recovery, Consultation with the Wyoming SHPO and the ACHP is required when proposed actions are expected to adversely affect properties eligible for the National Register and mitigation is determined to be the best course of action.

Data Recovery. There are two times during a project that data recovery may be implemented. The first is when it is determined prior to project construction that there will be an adverse effect to an NRHP eligible property. The project proponent, the BLM, and the SHPO work together to develop a data recovery plan which will mitigate the adverse effects. The second is after a discovery situation when it is determined that the project has already adversely impacted an historic property. Again, the project proponent, BLM authorized officer, and SHPO work to develop a plan that mitigates all effects of the construction. Data recovery in itself is a destructive process, thus it must be carried out in a way to successfully retrieve all pertinent information from the site.

HABS/HAER (Historic American Buildings Survey/Historic American Engineering Record). HABS/HAER documentation as a mitigation measure may be implemented if no other mitigation measure would adequately minimize the adverse effect. This documentation includes large format photography, drawings, and research of the property to document all aspects of the property prior to adverse effects.

Agreement Documents. In situations where data recovery or HABS/HAER documentation is not appropriate to mitigate adverse effects or multiple historic properties will be affected by a single undertaking, the BLM will work with the SHPO and the project proponent to develop an agreement document. Depending on the nature of the undertaking, this may result in a Memorandum of Agreement (MOA) or a Programmatic Agreement (PA). The agreement document will outline the manner in which adverse effects will be mitigated, and the roles and responsibilities of each signatory. The agreement document stays in effect until all measures have been completed to the satisfaction of all parties.

Cultural Resource Laws and Regulations

American Antiquities Act of 1906 provides for permits to authorize scholarly use of properties, for misdemeanor-level penalties to control unauthorized use, and for presidential designation of outstanding properties as national monuments for long-term preservation.

National Historic Preservation Act of 1966

- Section 106 directs all federal agencies to take into account effects of their undertakings (actions and authorizations) on properties included in or eligible for the NRHP.
- Section 110 sets inventory, nomination, protection, and preservation responsibilities for federally owned cultural properties. Section 110(c) requires each federal agency to designate a Preservation Officer to coordinate activities under the act.

American Indian Religious Freedom Act of 1978 establishes the policy of the United States to protect and preserve for the American Indian, Eskimo, Aleut, and Native Hawaiian the inherent right of freedom to believe, express, and exercise their traditional religions. Federal agencies are directed to evaluate their policies and procedures to determine if changes are needed to ensure that such rights and freedoms are not disrupted by agency practices.

Archaeological Resources Protection Act of 1979 provides felony-level penalties for the unauthorized excavation, removal, damage, alteration, defacement, or the attempted unauthorized removal, damage, alteration, or defacement of any archaeological resource, more than 100 years of age, found on public lands or Indian lands. The act also prohibits the sale, purchase, exchange, transportation, receipt, or offering of any archaeological resource obtained from public lands or Indian lands.

Native American Graves Protection and Repatriation Act of 1990 requires Native American consultation for the excavation and/or removal of “cultural items” including human remains, funerary objects, sacred objects, and objects of cultural patrimony. Consultation is also required if “cultural items” are discovered during land use activities.

Executive Order No. 13007: Indian Sacred Sites establishes access to and ceremonial use of Indian sacred sites by Indian religious practitioners on federal lands. The federal agencies shall avoid adversely affecting the physical integrity of such sacred sites and maintain confidentiality of said sites.

Appendix J

**Best Management Practices for
Reducing Non-Point Source Pollution**

APPENDIX J

BEST MANAGEMENT PRACTICES FOR REDUCING NON-POINT SOURCE POLLUTION

This appendix describes best management practices utilized to mitigate adverse effects caused by surface disturbing activities that can contribute to non-point pollution. It should be noted, there are multiple volumes of references for best management practices (BMPs) developed by government and nongovernmental agencies to reduce non-point sources of pollution. Many of these documents contain specific practices and design criteria; the Wyoming Department of Environmental Quality (WDEQ) publishes general BMPs for Wyoming (<http://deq.state.wy.us/wqd/watershed.asp#non>).

BMPs have been developed through experience working with disturbances in the Rawlins Field Office (RFO) from BLM approved actions and should be used in most cases along with the guidelines and best management practices presented in appendix B and appendix H of this Environmental Impact Statement (EIS). These practices are not stipulations but represent practices that in most cases will serve to improve the design and reduce the environmental impact of proposed BLM management actions in the Resource Management Plan Planning Area (RMPPA). Operators are encouraged to review these practices, incorporate them where appropriate, and where possible develop better methods for achieving the same goals.

The purpose of this section is not to attempt to select certain practices or designs and require that only those are used. It is not possible to evaluate all the known practices and make determinations as to which are "best", nor is it advisable. What is best must be determined as the result of a site specific investigation of the problem to be solved. What the RFO hopes to accomplish with this section of the appendix is to prescribe basic construction techniques that could be used regardless of project design or purpose.

Section 303(e) of the Clean Water Act and 40 CFR 130.5 require states to maintain a "Water Quality Management Continuing Planning Process." The process must establish procedures for adoption and appeals which, among other items, address BMPs. BMPs are advisory rather than regulatory. They are a key element in a State Non-point Source Management Plan, with which the federal government must comply under Executive Orders (EO) 12088 and 12372, and Clean Water Act Sections 319(k) and 301(k). The practices described in this document are designed to meet the intent of the State of Wyoming's BMPs for BLM approved activities. The reader is encouraged to review the State of Wyoming lists of BMPs which have been developed in response to the Clean Water Act and address silviculture, grazing and hydrology, and a policy statement in lieu of BMPs for minerals and oil and gas. (<http://deq.state.wy.us/wqd/watershed.asp#non>)

Management Planning Process

Standard practices or BMPs may develop through the National Environmental Policy Act (NEPA) process into stipulations prior to lease or grant issuance, or they may serve as a basis for Conditions of Approval (COA). If these practices (or newly developed techniques) are already incorporated into plans for development submitted by a permittee, such plans may be approved. BLM considers all project proposals; however it is the burden of the applicant to

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describe the design and construction techniques planned. If a project's design, scheduling, and construction techniques can mitigate environmental concerns, construction may be allowed without COAs.

As directed by the Federal Land Policy and Management Act and bureau policy, the BLM has developed a three tiered resource management planning process to make land use planning decisions. These tiers are policy, resource management plans, and activity plans.

Areas of accelerated soil erosion, poor or unstable soils, eroding stream channels, and threatened or impaired stream reaches for water quality can be identified as issues during the resource management plan tier of the process or through stakeholder groups with local organizations on listed water bodies. Soil and water conservation practices are addressed in a general fashion during the land use planning tier and in site-specific detail during the activity planning and implementation tier of the process.

The Bureau's non-point source strategy is to continue to:

- Provide cooperation and assistance to state agencies and conservation districts in the management of the public lands to reduce non-point source pollution sources.
- Incorporate water quality impacts, including non-point sources, into land management actions planned and implemented by the bureau and identify and address non-point source water quality issues in bureau activity plans for specific projects.
- Provide personnel and resources to identify non-point source pollution and control techniques through coordinated research efforts and the implementation of BMPs.
- Proactively implement program practices in conducting land use and land management activities to reduce or avoid water quality impacts and to improve water quality as necessary to meet management objectives and regulatory requirements.

To protect water quality from non-point source pollution, as applied by the RFO on BLM lands, the BMP program consists of: 1) defining practices, based on the best information available, that are expected to protect water quality; 2) monitoring to ensure the practices are applied; 3) monitoring to determine the effectiveness of practices; 4) mitigation to address unforeseen problems after the activity begins; and, 5) adjustment of design specifications of BMPs for future activities, where appropriate. Typically a site and/or project specific NEPA analysis will define practices and specify monitoring needs if applicable. The project proponent would then be responsible to mitigate unforeseen problems as they arise, typically with BLM review, and the BLM would be responsible to make adjustments to the process or methods used and as needed after each project.

The Wyoming BLM policy on reclamation assumes that an area can and shall be ultimately reclaimed, and requires that every surface disturbance on public lands receive attention for short-term stabilization and long-term reclamation. Mitigation measures or BMPs reduce, to the extent possible, the amount of reclamation that ultimately must take place. The permit or authorization is the means provided for ensuring that mitigation measures or COAs are implemented. Compliance inspections during operations ensure that mitigation, COA and/or stipulations are being followed.

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Watershed Protection

The entire land surface should be considered for non-point pollution control, with specific attention given to areas where the flow of water is concentrated naturally or due to construction (including roads, well pads, drainage ditches and steam channels). Stream sediment, phosphate, and salinity load would be reduced where possible.

The following standard practices are to protect watershed function:

- Construction of ephemeral, intermittent, and perennial streams crossings associated with road and utility line construction would generally be restricted until after spring runoff and until normal flows are established.
- The inner gorge of intermittent and ephemeral drainages should be burned in such a manner as to leave unburned patches of vegetation. The use of herbicides for vegetative manipulation should proceed with great care when in the proximity of willows, cottonwoods, or aspens, so as not to damage such stands unless the prescription actually calls for such removal.
- Herbicide loading sites would be located at least 500 feet from live water, floodplains, riparian areas, and all special status plant locations.
- Vegetative buffer strips should be maintained between developed recreational facilities and live water. Prior to installing toilet facilities associated with recreation, ground water protection should be provided for.
- Installation of instream structures for fisheries, watershed, or irrigation enhancement should be completely engineered if the high flow for the stream exceeds 10 cfs (cubic feet/second).
- To minimize long-term surface disturbances within the vegetated sand dunes or other sensitive soils, options such as directional drilling, smaller well pads, and surface lines should be considered. To enhance reclamation success through surface stability, techniques to reduce wind erosion should be considered. These methods could include snow fences, soil tackifiers, and erosion control matting.

Floodplain protection is required by EO 11988, in reference to federal real property and facilities. It states that facilities are to be located in a floodplain (i.e., when there is no practicable alternative), agencies shall ensure that flood protection measures are applied to new construction, or the agency can rehabilitate existing structures; elevate structures rather than fill the land; provide flood height potential markings on facilities to be used by the public; and, when the property is proposed for lease, easement, right of way, or disposal, the agency must attach restriction on uses in the conveyance or withhold from such conveyance.

For the most part standard practices to protect water quality and floodplains are to avoid surface disturbing activity in identified 100-yr floodplains, within 500 feet (ft) of perennial waters and wetland/riparian and 100 ft. from the inner gorge of ephemeral channels. These buffers provide an opportunity for concentrated flows to be dispersed before they reach a water body and often preclude construction in riparian zones, except for linear features. Surface disturbing activities and permanent facilities placement avoid these buffers unless it is determined through site-

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specific analysis, that there is no practical alternative. If such a circumstance exists, then all practical measures to mitigate possible harm to the above areas are employed. These mitigating measures would be determined case by case and may include (but are not limited to) diking, lining, screening, mulching, terracing, and diversions.

Floodplains by their very nature are unsafe locations for permanent structures. With an inundation of flood waters, soils disturbed by construction could experience a rate of erosion greater than undisturbed sites. There is an additional concern over the potential for flood waters to aid in the dispersal of hazardous materials that may be stored within permanent structures. Therefore, floodplains should have no permanent structures constructed within their boundaries unless it can be demonstrated on a case-by-case basis that there is no physically practical alternative. In cases where identified 100-yr floodplain construction is approved, additional constraints would be applied through COAs.

Soils

Current objectives focus on soil conservation planning for surface disturbance actions. Soil conservation should be addressed during the initial phase of any surface disturbing action, thereby maintaining soil productivity and stability levels through the use of existing guidelines and techniques. Some areas may require more thorough soil management practices than others; however this is dependent on the type and duration of the action and the effect on site-specific soil characteristics.

Management of the soil resource would continue to be based on the following factors: (1) Evaluation and interpretation of soils in relation to project design and development, (2) Identification and inventory of soils for baseline data (soil surveys), and (3) Identification and implementation of methods to reduce accelerated erosion of top soil.

Evaluation and interpretation involves identification of soil properties that would influence their use, and recommendations for development while minimizing soil loss. Projects would be examined on a site-specific basis, evaluating the potential for soil loss and the compatibility of soil properties with project design. Stipulations and mitigating measures are provided on a case-by-case basis to ensure soil conservation and practical management. Projects requiring soil interpretations include construction of linear right-of-way (ROW) facilities (i.e., pipelines, roads, railroads, and power transmission lines); construction of water impoundments; rangeland manipulation through fire or mechanical treatments; construction of plant site facilities, pump stations, well pads, and associated disturbances; and reclamation projects.

Soil surveys are designed to update general soils information and provide data to those areas lacking soil inventories. Allotments and areas impacted by oil and gas projects will receive priority in the soil survey process and BLM will encourage and participate in soil surveys as opportunities arise.

Before a surface disturbing activity is authorized, topsoil depth would be determined. The amount of topsoil to be removed, along with topsoil placement areas, would be specified in the authorization. The uniform distribution of topsoil over the area to be reclaimed would be required unless conditions warrant a varying depth. On large surface disturbing projects (e.g., gas processing plants), topsoil would be stockpiled and seeded to reduce erosion. Where feasible, topsoil stockpiles would be designed to maximize surface area to reduce impacts to soil microorganisms. Stockpiles remaining less than two years are best for soil microorganism

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survival and native seed viability. It is recommended that stockpiles be no more than 3 to 4 feet high. Areas used for spoil storage would be stripped of topsoil before spoil placement. The replacement of topsoil after spoil removal would be required.

Some examples of standards applied throughout the Field Office area based on soil management criteria are as follows:

- Individual road closures due to saturated soil conditions when soil resource damage would occur due to wheel rutting or compaction of wet soils.
- Salvage and subsequent replacement of topsoil whenever possible on surface disturbing activities.
- Avoiding disturbance on unstable slopes or slopes greater than 25 percent.
- Identification of critical erosion condition areas during site-specific project analysis, and activity plan development for the purpose of avoidance and special management.
- Temporary disturbances which do not require major excavation (e.g., small pipelines and communication lines) may be stripped of vegetation to ground level using mechanical treatment, leaving topsoil intact and root mass relatively undisturbed.

Uncontrolled settlement of clay particles does not provide a consistently adequate seal on a stock pond or reservoir. Compaction or permeability testing should be used to determine pit characteristics in conjunction with BLM engineers. If clay soils are used as stock pond lining, they should have a liquid limit greater than 30 and a Plasticity Index of at least 20. Assuming that bentonite would sufficiently seal a pit is not a good procedure, because the bentonite must be adequately compacted, with uniform coverage and density. If not, a chemical reaction may occur between the bentonite and native soil particles. Bentonite is also subject to cracking if it is not designed properly and the layer may be penetrated by hooves if not buried sufficiently.

In general, emphasis should continue to be placed on the reduction of soil erosion and sediment. Of particular importance would be those areas with saline soils or those areas with highly erodible geology and soils.

Air-Born Dust and Air Quality

BLM actions must comply with all applicable air quality laws, regulations, and standards. As projects are proposed that include possible major sources of air pollutant emissions, air quality protection-related stipulations are added to BLM permits and rights-of-way grants. In addition BLM coordinates with the WDEQ-Air Quality Division (AQD), during the process of analysis. This coordination results in technical review of applications for permits and/or identification of additional stipulations to be applied to these permits.

Dust Control. The following standard practices limit the emission of fugitive dust:

- The use of water or chemicals to control dust in the demolition of structures, in construction operations, grading of roads, or clearing of land.

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- The use of water for dust abatement may be considered on a case-by-case basis. The water should meet state standards for this use and be permitted by the State of Wyoming. Only the water needed for abating dust should be applied; this method should not be used as a water disposal option under any circumstances. There should be no traces of oil or solvents in water used for dust abatement.
- All weather surfacing of roads using gravel or asphalt paving and the application of water or suitable chemicals to keep dust in place on roads or materials stockpiles.
- Appropriate road design including shape, drainage and surface material to protect road bed from being eroded.

Prescribed Fire Emissions. The emissions that may be created directly by BLM activities are mitigated. Prescribed fires are conducted to reduce emissions by burning only at appropriate fuel moistures and wind speeds (among other factors), which reduce as much as possible the smoke created in locations near populated areas. All BLM activities that may potentially cause undesirable air quality impacts are also coordinated with the WDEQ-AQD. Permits to conduct these activities are secured (where necessary) before the activity begins, to ensure compliance with all federal, state, and local air quality laws.

Pipelines and Communication Lines

Existing roads would be used for access to utility lines where possible to minimize surface disturbances. Where possible, clearing of pipeline and communication line rights-of-way would be accomplished with the least degree of disturbance to topsoil. Where topsoil removal is necessary, it would be stockpiled (wind-rowed) and respread over the disturbance after construction and backfilling are completed. Vegetation removed from the ROW would also be required to be respread to provide protection, nutrient recycling, and a seed source.

On ditches exceeding 36 inches in width, 6 to 12 inches of surface soil should be salvaged where possible from disturbed sites. When pipelines and communication lines are buried, there should be at least 48 inches of backfill on top of the pipe. Backfill should not extend above the original ground level after the fill has settled. Bladed surface materials would be respread on the cleared route once construction is completed.

To promote soil stability, the compaction of backfill over the trench would be required (not to extend above the original ground level after the fill has settled). Water bars, mulching, and terracing would be required as needed to minimize erosion. Instream protection structures (e.g., drop structures) may be required in drainages crossed by a pipeline to prevent erosion.

For communication lines or other small lines like plastic water lines that do not require trenching, a ditch witch or similar trenching machine should be used to reduce disturbance and the need for reclamation.

Grazing BMPs

Proper grazing is the practice of managing forage harvest by all grazing animals including domestic livestock at a sustainable yield that does not accelerate erosion and sedimentation above acceptable levels for the receiving waters. Proper grazing will maintain or increase plant cover including residue, which should in turn slow down or reduce runoff and increase water

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infiltration. Allotment management plans, conservation plans or similar documents should contain a list of the BMPs most appropriate for the area. Management plans must be developed with reasonable goals and objectives and progress toward goals and objectives must be monitored. Monitoring must include measures of actual changes in resource conditions as well as measurements of completion of objectives and tasks. BMPs have been developed for Domestic Animals, Wildlife (Big Game Animals), Wildlife (Small Game and Nongame Animals), Wild Horses, Proper Grazing—Riparian and Wetland Areas, Fencing, Livestock Herding, Access Roads, Water Development—Instream and Offstream, Land Treatment—Biological, Land Treatment—Mechanical, Weed and Pest Management, and Windbreaks (WDEQ 1997).

BLM Healthy Rangelands Standards and Guidelines will be used for assessment of water quality issues associated with BLM activities. Allotments are evaluated based on these criteria and BMPs can be developed within Allotment Plans to improve or maintain these standards. Included in these assessments are an evaluation of water quality, wetland/riparian areas, and upland conditions among other factors. These serve as the guidance and goals for Allotment Plans and would be used to evaluate monitoring and apply an adaptive management approach. These BMPs are developed at the site specific level of planning to account for local constraints and conditions.

Many grazing systems exist. There is no single system for all vegetation types. The proper system or combination of systems must be selected to fit any given site. Consideration must be given to season of use, soil type, precipitation, range condition, stocking rates, type of livestock, plant growth rates, and ecological site potential. The numbers of all grazing animals should be maintained in balance with their habitat. Options for developing a grazing management system at a particular location include but are not limited to:

- Livestock stocking rates
- Wild horse and/or wildlife densities
- Livestock, wild horse or wildlife distribution
- Timing and duration of each rest (including complete rest) and grazing period
- Livestock kind and class
- Forage allocation for livestock, wildlife and wild horses
- Water developments to improve distribution
- Salt/mineral supplements (these should be located away from water sources)
- Livestock access control
- Rehabilitation measures

Well Pads and Facilities

Site specific reclamation procedures would be developed in each Application for Permit to Drill (APD), ROW application, or Sundry Notice submitted to the BLM for review and approval prior to the authorization of surface-disturbing activities, mitigation measures can be applied.

Both produced water and reserve pits should be constructed to ensure protection of surface and groundwater. The review to determine the need for installation of lining material should be done on a case-by-case basis and consider soil permeability, water quality, and depth to ground water. Oil-based muds would be allowed in closed drilling systems. Drill cuttings and any remaining oil-based drilling fluids would be disposed in an environmentally acceptable manner.

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Pits should be lined if there is not sufficient clay in the building material to prevent infiltration of fluids into shallow groundwater.

Reserve pits would not be located in areas where ground water is less than 50 feet from the surface and soil permeability is greater than 10^{-7} cm/hr. If ground water is encountered during the setting of the conductor, a closed drilling system will be used. Pits would be fenced as specified in individual authorizations. Any pits with harmful fluids in them shall be maintained in a manner that would prevent migratory bird mortality. Drilling pits are exempt from hazardous waste regulations as long as they are covered with 5 feet of soil after use.

Abandoned sites must be satisfactorily rehabilitated in accordance with a plan approved by BLM (See restoration section). Soil samples may be analyzed to determine reclamation potential, appropriate reseeding species, and nutrient deficits. Tests may include pH, mechanical analysis, electrical conductivity, and sodium content. Terraces or elongated water breaks would be constructed after slope reduction. Disturbances should be reclaimed or managed for zero runoff from the location until the area is stabilized. All excavations and pits should be closed by backfilling and contouring to conform to surrounding terrain. On well pads and larger locations, the surface use plan would include objectives for successful reclamation, including soil stabilization, plant community composition, and desired vegetation density and diversity.

On producing locations, operators would be required to reduce slopes to original contours (not to exceed 3:1 slopes). Areas not used for production purposes should be backfilled and blended into the surrounding terrain and reseeded. Erosion control measures should be installed, as they would be required after slope reduction. Facilities would be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.

Any produced water pit or drilling fluids pit that shows indications of containing hazardous wastes would be tested for the Toxicity Characteristic Leaching Procedure constituents. If analysis proves positive, the fluids would be disposed of in an approved manner. The cost of the testing and disposal would be borne by the potentially responsible party.

No surface disturbance is recommended on slopes in excess of 25 percent unless erosion controls can be ensured and adequate revegetation is expected. Engineering proposals and revegetation and restoration plans would be required in these areas.

Reclamation

Current BLM policy recognizes that there may be more than one correct way to achieve successful reclamation, and a variety of methods may be appropriate to the varying circumstances. BLM should continue to allow applicants to use their own expertise in recommending and implementing construction and reclamation projects. These allowances still hold the applicant responsible for final reclamation standards of performance. All reclamation needs to conform to BLM reclamation policy (USDI-BLM 1990).

BLM reclamation goals emphasize 1) protection of existing native vegetation, 2) minimal disturbance of existing environment, 3) soil stabilization through establishment of ground cover, 4) establishment of native vegetation consistent with land use planning, and 5) monitoring and management of the reclamation sites to evaluate reclamation success.

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All reclamation is expected to be accomplished as soon as possible after the disturbance occurs, with efforts continuing until a satisfactory revegetation cover is established and the site is stabilized (3 to 5 years). Only areas needed for construction would be allowed to be disturbed.

On all areas to be reclaimed, seed mixtures would be required to be weed-free and site-specific, composed of native species, and would be required to include species promoting soil stability. A predisturbance species composition list must be developed for each site if the project encompasses an area where there are several different plant communities present. Livestock palatability and wildlife habitat needs would be given consideration in seed mix formulation. BLM guidance for native seed use is BLM Manual 1745 (Introduction, Transplant, Augmentation, and Reestablishment of Fish, Wildlife, and Plants), and Executive Order No. 13112 (Invasive Species).

Interseeding, secondary seeding, or staggered seeding may be required to accomplish revegetation objectives. During rehabilitation of areas in important wildlife habitat, provision would be made for the establishment of native browse and forb species, if determined to be beneficial for the habitat affected. Follow-up seeding or corrective erosion control measures may be required on areas of surface disturbance which experience reclamation failure.

Trees, shrubs, and ground cover (not to be cleared from rights-of-way) would require protection from construction damage. Backfilling to preconstruction condition (in a similar sequence and density) would be required. Restoration of normal surface drainage would also be required.

Any mulch used would be free from mold, fungi, or noxious or invasive weed seeds. Mulch may include native hay, small grain straw, wood fiber, live mulch, cotton, jute, synthetic netting, and rock. Straw mulch should contain fibers long enough to facilitate crimping and provide the greatest cover.

The grantee or lessee would be responsible for the control of all noxious and invasive weed infestations on surface disturbances. Aerial application of chemicals would be prohibited within one-quarter mile of special status plant locations. Control measures would adhere to those allowed in the RFO Noxious Weed Control and Commercial Site Vegetation Control Environmental Assessment (EA) (WY-037-EA6-122), and Vegetation Treatment on BLM Lands in Thirteen Western States EIS and Record of Decision (ROD) (USDI-BLM 1991). Herbicide application would be monitored by the BLM authorized officer.

Types of Roads

Access Roads. Access roads should be kept to a minimum and used when dry or if all-weather surfaced. Adequate drainage and erosion minimization should be incorporated into road design. Roads should be designed to encourage the shedding of water from the surface before it gains enough concentration or velocity to cause erosion. After water is shed from the road surface energy dissipation structures should be designed, again with the goal in mind to reduce the concentration and velocity of water. There are two types of roads throughout the RFO, this discussion will be separated into two track undeveloped access roads and designed and maintained surfaced roads.

Undeveloped Two Track Roads. Use of undeveloped two tracks should be kept to a minimum and they should only be used during dry conditions, if possible. If areas are identified with

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multiple two tracks with the same destination, brush barriers or signing should be used to identify the best quality two-track road for use and discourage use of other unnecessary two tracks. As funding is available, these unnecessary two-tracks should be reclaimed.

If erosional features are present on necessary two tracks, including but not limited to excessive rutting with evidence of concentrated flow during storm events, sediment deposition adjacent to the two tracks, ponding in ruts, and/or ruts greater than 6 inches in depth; the road should be considered for a designed surface road. If the road is not improved drainage should be improved by the installation of water bars, culverts, and/or wing ditches to reduce concentrated flows.

Developed or Designed Roads

Roads would be constructed as described in BLM Manual 9113. New main artery roads would be designed to reduce sediment loading to surface waters. Where necessary, running surfaces of the roads would be graveled if the base does not already contain sufficient aggregate. Developed roads would be upgraded to an all-weather surface if access will occur during winter months or if road is in sensitive soils.

All developed roads should be designed with and maintained to preserve some type of surface shape to reduce water concentration, surface flow, ponding and resulting safety and maintenance problems. Two commonly accepted surface shape designs are crowned roads where the center of the road is at the highest elevation and the sides are lower allowing for the shedding of water off the road surface and outsloped roads that shed water to the downslope side of the road. Insloping should only be used when outsloping or crowning is infeasible due to safety considerations or erosion on the outslope is a great concern, since drainage on the inslope will require ditches and cross-drainage. Outsloped or insloped roads should only be used on roads with less than 6 percent grade (USDI-BLM 1985).

On surfaced road with grades greater than 8 percent, surface shape alone will probably not be enough to protect the road surface and cross-drainage systems should be considered (USDA 1997). The two most common approaches are waterbars that shed water from the surface of the road and drainage ditches, or culverts to transport water from the road surface to a location where concentrated flow is dispersed. BLM Manual section 9113 should be used for accepted specifications.

To control or reduce sediment from roads, guidance involving proper road placement and buffer strips to stream channels; surfacing; proper drainage; and in some cases, redesign or closure of old roads or seasonal closures, would be developed when necessary. Construction may also be prohibited during periods when soil material is saturated, frozen, or when watershed damage is likely to occur.

On newly constructed permanent roads, the placement of topsoil, seeding, and stabilization would be required on all cut and fill slopes unless conditions (e.g., rock) prohibit it. No unnecessary sidecasting of material (e.g., maintenance) on steep slopes would be allowed. Snow removal plans may be required so that snow removal does not adversely affect reclamation efforts or resources adjacent to the road.

Reclamation of abandoned roads would include requirements for reshaping, recontouring, resurfacing with topsoil, installing water bars, and seeding on the contour. The removal of

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structures such as bridges, culverts, cattleguards, and signs usually would be required. Stripped vegetation would be spread over the disturbance for nutrient recycling where practical. Fertilization or fencing of these disturbances would not normally be required. Additional erosion control measures (e.g., fiber matting) and road barriers to discourage travel may be required in addition to signing.

Road closures may be implemented during crucial periods (e.g., wildlife winter periods, spring runoff, and calving and fawning seasons). These would require signing or the areas being designated in a publicly available map.

Methods for shedding water from road surfaces. This can be done by installing water bars on steep sections and not allowing ruts to develop in others. Wear on access roads can be significantly reduced by minimizing use when they are wet. Good design on access roads that have a significant amount of traffic can include surfacing, installation of road drainage such as wing ditches, culverts and proper maintenance. As necessary for erosion control and energy dissipation structures such as wing ditches, riprap and culverts should be part of the road design. Riprap should be placed at outlets of culverts and the inlets of drainage structures, where possible. All riprap should be angular rock and placed on geotextile fabric. Culverts should be considered for cross-drainage when travel is expected to exceed ten to fifteen vehicles per day, regardless of surface design and culverts should be 18 inches or greater in diameter (BLM Manual 9113).

Methods for designing road crossings. Active streams are those that maintain aquatic vegetation, animal or fish populations. Other stream crossings should follow BLM Manual 9113 specifications. The majority of active streams are intermittent or perennial; however there may be some portions of ephemeral systems that meet this definition. All crossings should consider the failure of the crossing during flows beyond the design capacity. This can be accomplished by allowing the road fill to be breached in pre-determined locations during storm events greater than the design capacity, and not diverting the water to a new pathway causing gullying, erosion, and formation of a new channel.

The goal of any design should be to maintain current fluvial processes for moving sediment and flow in the active channel. This results in designs that do not confine flows to only one portion of the channel or flood plain and do not result in a grade change through the crossing. Channel dimensions are a good indicator of the range of water, debris and sediment yield in the channel. The active stream bed width or annual scour can be used as an estimate the area required for the crossing to pass typical (1.5–2 year reoccurrence) flows. Similarly, the eroded area with temporary vegetation and flood terracing can be used as indicators of extreme events for reoccurrence intervals greater than 2 years. These field measurements along with peak flow events (Miller 2003) and other empirical methods should be used to determine design criteria for crossings.

In general, crossings designed to pass 100 year design storms would in most cases allow for unrestricted passage of flow and sediment from smaller storms. Crossing designs that simulate natural stream processes and provide unrestricted passage of flow and sediment can include bridges, low-water crossings, culverts, and bottomless culverts. The appropriate design should be chosen after careful consideration of local conditions including hydrologic conditions, soil erodibility, road utilization, and aquatic species presence.

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Where new or replacement culvert designs are chosen for crossings of active streams, the Active Channel Design Option should be followed if the channel slope is less than 3 percent, the culvert is less than 100 feet in length, and passage is required for aquatic species. Design criteria specific to the Active Channel Design Option include the following:

- Culvert width – The minimum culvert width shall be equal to, or greater than, 1.5 times the active channel width.
- Culvert slope – The culvert shall be placed level (0 percent slope).
- Embedment – The bottom of the culvert shall be buried into the streambed not less than 20 percent of the culvert height at the outlet and not more than 40 percent of the culvert height at the inlet. Embedment does not apply to bottomless culverts.

At sites where the channel slope is greater 3 percent or culvert length would exceed 100 feet, additional consideration should be given to alternate design options such as bridges or low-water crossings due to the difficulty of providing for the passage of aquatic species through culverts installed at these sites.

Citations

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Appendix K

**Plan of Development /
Detailed Proposed Action**

K.1 PLAN OF DEVELOPMENT/Detailed Proposed Action

K.1.1 Preconstruction Planning and Site Layout

Development activities proposed on fee and State of Wyoming surface lands would be approved by the Wyoming Oil & Gas Conservation Commission (WOGCC). The WOGCC permitting procedures require filing an APD with the WOGCC and obtaining an ROW from the surface owner.

The Operators would follow the procedures outlined below to gain approval for proposed activities on BLM-administered lands or minerals within the ARPA. The procedures described below are applicable to CBNG drilling and production activities (1,800-well program) and the deeper conventional natural gas drilling and production activities (200-well program) unless otherwise noted.

- Annual work plans for each developing or operational POD will be used instead of piecemeal individual APD filings. Each year on April 1, the Operators will submit to the BLM Rawlins Field Office comprehensive annual work plans for the following year, including APD packages and other appropriate permit application materials for the construction and development activities. The BLM, in conjunction with the Operators, will perform the usual on-site reviews and perform the other tasks necessary to prepare the program of work for site specific analysis under NEPA and permitting approval prior to the next drilling season. This procedure will allow for economies of scale with the NEPA process and provide a more comprehensive appraisal of the proposed action and their effects on the environment. This program should also reduce processing time for APDs. The Operators and the BLM will also assess and decide the method of analysis, including how the NEPA related work will be performed (either in-house or through third party contractors). Otherwise unplanned construction needs that arise during the course of the year and outside of the annual plan may be brought forward and proposed by operators and will be dealt with by the BLM appropriately, however the intent is to normally avoid individual APD submission and consideration.

Annual work or site specific plans for developing or operational PODs will include geo-referenced information compatible with ArcMap that details pad and well locations; pipeline routes; water transfer stations; road locations (resource, collector or local); road construction techniques (including gravel type and source); wing ditch, water bar and culvert placement, any closed system livestock watering facilities, any potential fence modification or cattle guard installations, injection well locations; and any existing infrastructure (wells, roads, pipelines etc.) in the townships receiving new development.

- The proposed facilities would be staked by the Operators and inspected by an interdisciplinary team and/or an official from the BLM to ensure consistency with the approved RMP and oil and gas lease stipulations.
- More detailed descriptions of the proposed activity or construction plans would be submitted to the BLM by the Operators when required for the proposed development. The plans would address concerns that may exist concerning construction standards, required mitigation, etc. Negotiation of these plans between the Operators and the BLM, if necessary to resolve differences, would be based on field inspection findings and would take place either during or after the BLM onsite inspection. Submissions of maps will include the associated GIS geo-referenced information.

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- The Operators and/or their contractors would revise APD/ROWs, as necessary, per negotiations with the BLM. The BLM would complete a project-specific environmental analysis that incorporates agreed upon construction and mitigation standards as detailed above. The BLM would then approve the annual proposal and attach the Conditions of Approval to the permit. The Operators must then commence the proposed activity within one year.

Following is a general discussion of proposed construction techniques to be used by the Operators. These construction techniques would be applicable to drill sites, pipelines, and access roads within the ARPA, and may vary between the well sites.

K.1.2 Construction and Drilling Phase

K.1.2.1 Access Road Construction

The road network within the ARPA is discussed in more detail in Chapter 3, Affected Environment. A typical roadway cross-section with width specifications is shown on Figure K-1.

BLM Manual Section 9113 road classifications categorize ARPA roads into three separate classes:

- 1) **Collector Roads.** These roads normally provide primary access to large blocks of land and connect with or are extensions of a public road system such as WYO 789. Collector roads are two-lane and require application of the highest road standards. The predominant design speed is 30 to 50 mph depending on terrain and/or as determined by BLM, and the subgrade width is a minimum of 28 feet (24 feet full-surfaced travelway). A typical roadway cross-section with width specifications is shown in Figure K-1.
- 2) **Local Roads.** These are low volume roads providing the internal access network within an oil/gas field such as Carbon County Road 608. The design speed is 20-50 mph depending on terrain, and the sub grade width is normally 24 feet (20 feet full-surfaced travelway). Low volume roads in mountainous terrain may be single-lane roads with turnouts.
- 3) **Resource Roads.** These are normally spur roads that provide point access. Roads servicing individual oil/gas exploration and production locations fall within this classification. The road has a design speed of 15-30 mph and is constructed to a minimum subgrade of 16 feet (12 feet minimum full-surfaced travelway) with intervisible turnouts.

The Operators propose to construct required new access roads across public lands in accordance with BLM Manual 9113 standards. Roads would be located to minimize disturbances and maximize transportation efficiency. Roads would be closed and reclaimed by the Operators when they are no longer required for production operations, unless otherwise directed by the BLM.

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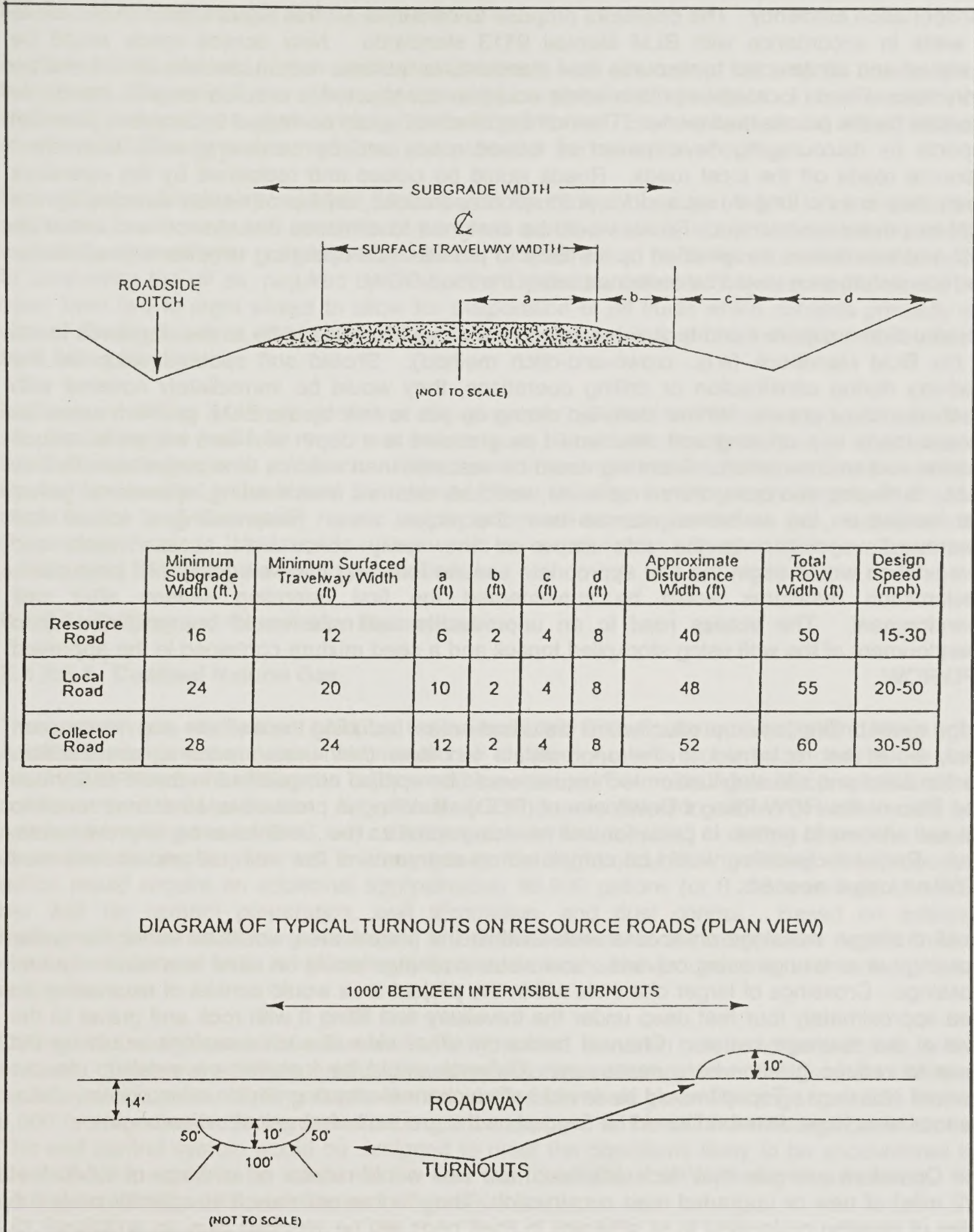


Figure K-1. Typical Roadway Cross-Section with Width Specifications

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Based on onsite reviews, roads would be located to minimize disturbances and maximize transportation efficiency. The operators propose to construct access roads across public lands to wells in accordance with BLM Manual 9113 standards. New access roads would be designed and constructed to resource road standards to facilitate reclamation should the well be a dry hole. Roads located on private lands would be constructed in accordance with standards imposed by the private land owner. The number of roads would be limited to decrease potential impacts by discouraging development of looped roads and by accessing wells from short resource roads off the local roads. Roads would be closed and reclaimed by the operators when they are no longer required for production operations, unless otherwise directed by the BLM or private landowners. Roads would be designed to minimize disturbance and would be built and maintained as specified by the BLM to provide safe operating conditions at all times. Surface disturbance would be contained within the road ROW.

Construction equipment and techniques used by the operators would be to the standards found in the BLM Handbook (e.g., crown-and-ditch method). Should soft spots develop on the roadway during construction or drilling operations, they would be immediately covered with crushed rock or gravel. Where identified during on-site review by the BLM, problem areas on access roads to producing well sites would be graveled to a depth of 4 to 6 inches to reduce erosion and sedimentation. Graveling would be accomplished within a time period specified by BLM. Surfacing and base course materials would be obtained from existing, operational gravel pits located on fee or federal sources near the project area. Respreading of topsoil and windrowed vegetation to the side slopes of the newly constructed access roads and revegetation would begin the first appropriate season following the well going into production. Reclamation measures would be implemented the first operating season after well abandonment. The access road to an unproductive well site would be reclaimed upon abandonment of the well using stockpiled topsoil and a seed mixture contained in the approved APD/ROW.

In the event drilling is non-productive, all disturbed areas, including the well site and new access road, would be reclaimed to the approximate landform that existed prior to construction. Reclamation and site stabilization techniques would be applied as specified in the APD Surface Use Plan or the ROW Plan of Development (POD). If drilling is productive, all access roads to the well site would remain in place for well servicing activities (i.e., maintenance, improvements, etc.). Partial reclamation would be completed on segments of the well pad and access road ROW no longer needed.

Small drainage crossings on access routes within the project area would be either low water crossings or crossings using culverts. Low water crossings would be used in shallow channel crossings. Crossings of larger channels within the project area would consist of excavating an area approximately four feet deep under the travelway and filling it with rock and gravel to the level of the drainage bottom. Channel banks on either side of such crossings would be cut down to reduce grade where necessary. Culverts would be installed on smaller, steeper channel crossings. Topsoil would be saved before channel-crossing construction occurs. Also, the total area to be disturbed would be flagged on the ground before construction begins.

The Operators estimate that each proposed new well would require an average of 2,640 feet (1/2 mile) of new or upgraded road construction. They further estimate that approximately 0.5 miles of pipeline co-located in or adjacent to road beds will be required plus an additional 15 miles of larger sales pipeline running from the Muddy Mountain vicinity to the Brown Cow POD.

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K.1.2.2 Well Pad Design and Construction

A graded well pad would be constructed at each well site using cut and fill construction techniques. Figure K-2 is a schematic drawing of a typical drill site layout. The dimensions of each well pad would be approximately 360 feet by 240 feet. Each well site would initially disturb an estimated 2 acres and be reclaimed to 1 acre after the cessation of drilling.

Generally, two temporary mud pits 50 feet wide by 10 feet deep by 50 feet long, constructed adjacent to each other and connected by a small overflow trench, would be excavated at each well and reclaimed after completion operations. Topsoil would be removed and stockpiled prior to excavating the pit as, required by BLM. The Operators estimate the reserve pits would be open from two to eight weeks to allow for evaporation of pit fluids which consists primarily of water. During this time, the pits would be fenced on all sides to prohibit wildlife and livestock from falling into the pit.

In the event drilling is non-productive at any given site, all disturbed areas associated with that site, including the well site and new access road, would be reclaimed to the approximate landform existing prior to construction. Reclamation and site stabilization techniques would be applied as specified in the Master Surface Use Plan (MSUP). If drilling is productive, all access roads to the well site would remain in place for well-servicing activities (i.e., maintenance, improvements, etc.). Interim reclamation would be completed on segments of the well pad and access road ROW that are no longer needed.

K.1.2.3 Drilling and Completion Operations

K.1.2.3.1 Coalbed Natural Gas

The natural gas and water injection wells would be drilled with conventional drilling rigs. Additional equipment and materials needed for drilling operations would be trucked to the well site. Water for use in drilling the wells would be obtained from existing wells completed in the coal seams of the Mesaverde. Approximately 700 barrels (29,400 gallons) of water would be needed for drilling each CBNG well. The actual water volume used in drilling operations would depend on the depth of the well and any losses that might occur during drilling. The proposed action would require an additional approximately 96,000 gallons (or 0.295 acre-feet) of water per well for cement preparation, well stimulation, and dust control. Based on existing hydrogeologic information, groundwater in the coal seams at the completion depths in the existing natural gas wells is hydraulically isolated from shallow groundwater and surface water resources.

Drilling mud would consist of native mud and bentonite. As down hole conditions dictate, small amounts of polymer additives and/or potassium chloride salts may be added for hole cleaning and clay stabilization. Drilling depths for the Mesaverde coals generally range from 250 feet to 6,000 feet and the producing formation would be exposed to the drill bore through perforations. The well control system would be designed to meet the conditions likely to be encountered in the hole and would be in conformance with BLM and State of Wyoming requirements. A completed CBNG well bore is shown in Figure K-3.

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DETAILED PROPOSED ACTION

TYPICAL DRILL SITE LAYOUT

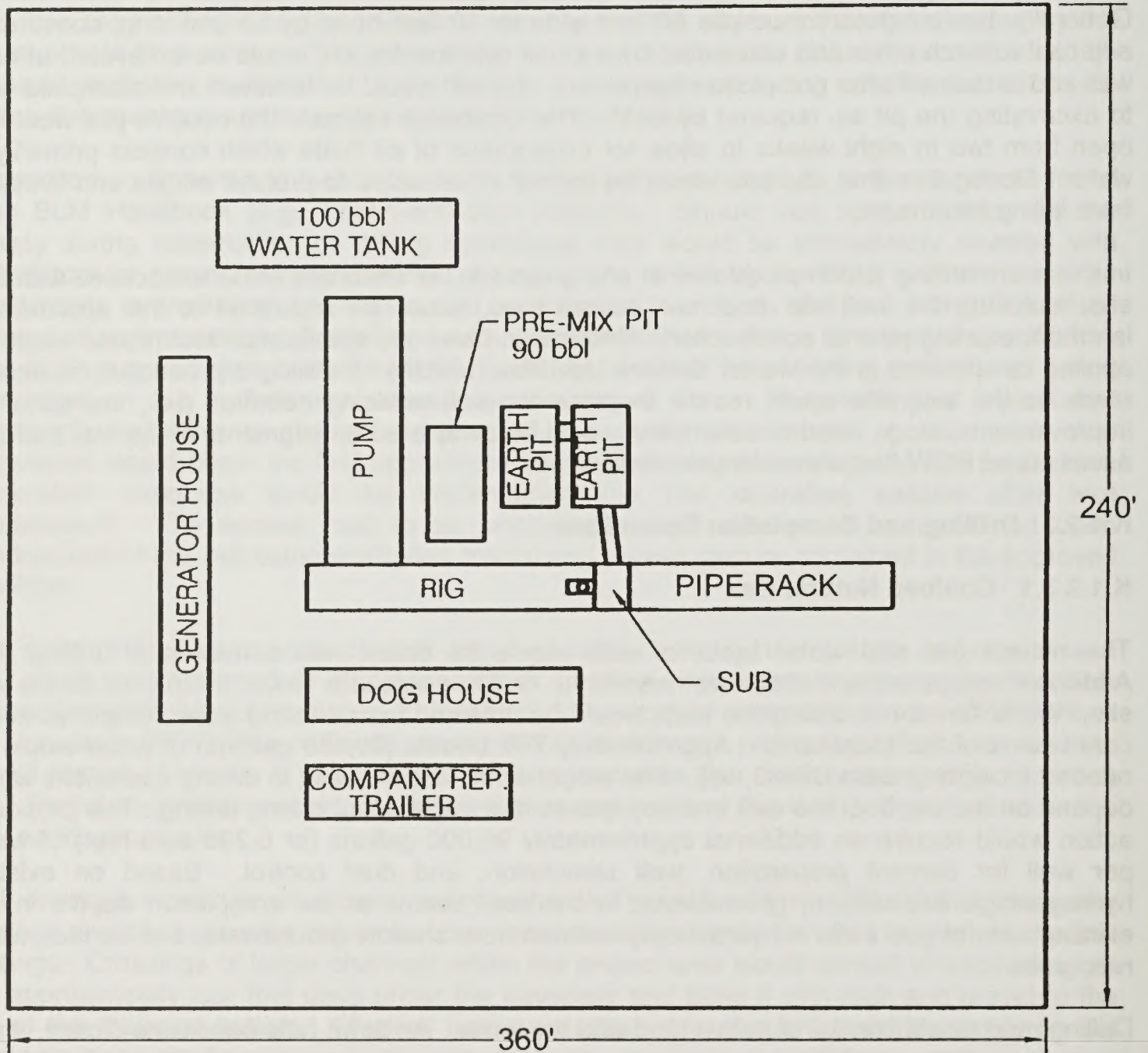


Figure K-2. Typical Drill Site Layout – Atlantic Rim Natural Gas Project

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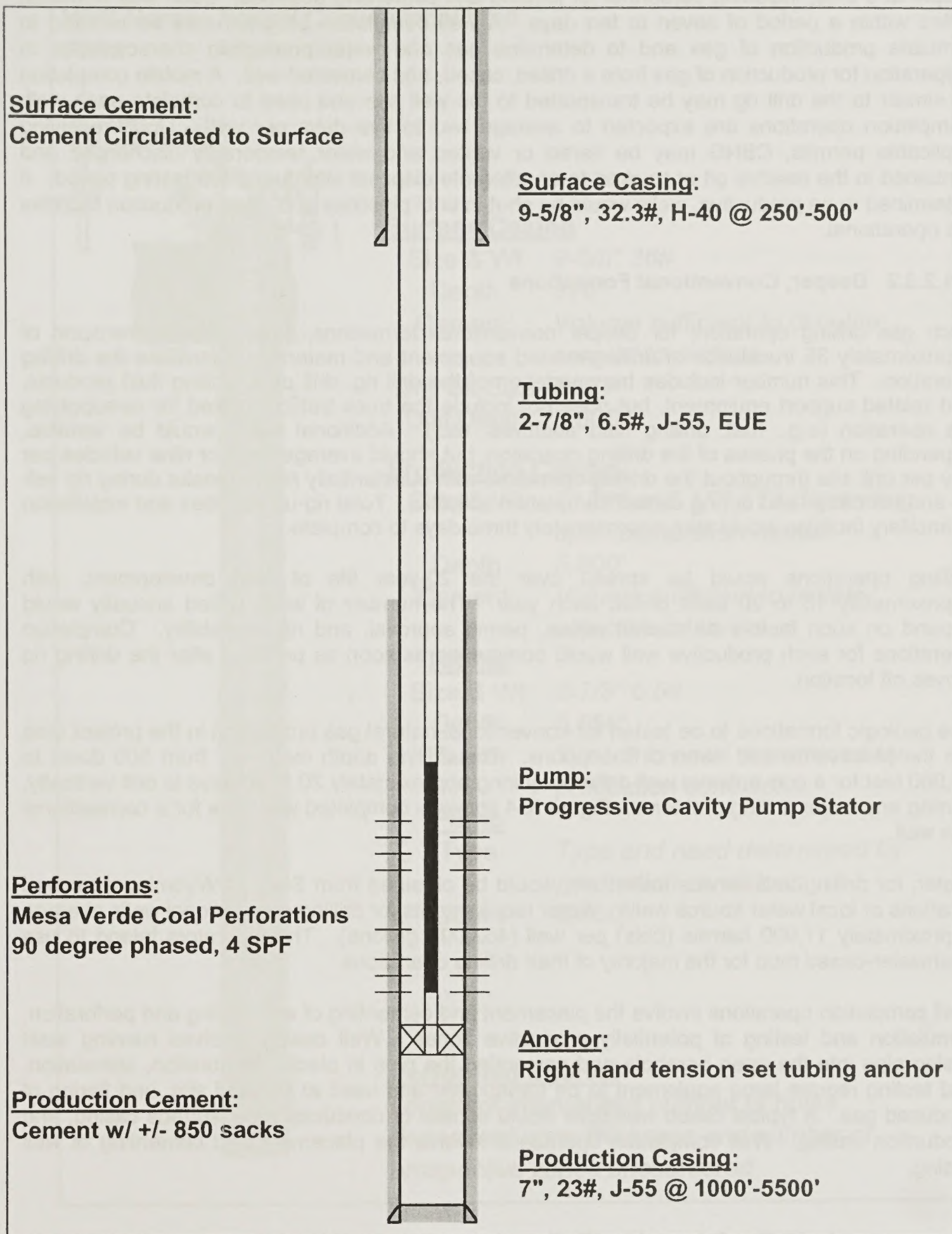


Figure K-3. Completed Conventional Well Bore – Atlantic Rim Natural Gas Project.

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The drilling and completion operation for a well normally requires approximately ten to fifteen people at a time, including personnel for logging and cementing activities. Each well would be drilled within a period of seven to ten days. A well completion program may be initiated to stimulate production of gas and to determine gas and water production characteristics in preparation for production of gas from a drilled, cased, and cemented well. A mobile completion rig similar to the drill rig may be transported to the well site and used to complete each well. Completion operations are expected to average two to five days per well. Upon receiving applicable permits, CBNG may be flared or vented and water temporarily discharged and contained in the reserve pit or trucked to an alternate disposal site during the testing period. If determined to be productive, wells would be shut-in until pipelines and other production facilities are operational.

K.1.2.3.2 Deeper, Conventional Formations

Each gas drilling operation, for deeper conventional formations, would require transport of approximately 35 truckloads of drilling-related equipment and materials to facilitate the drilling operation. This number includes transportation of the drill rig, drill pipe, drilling fluid products, and related support equipment, but does not include the truck traffic required for re-supplying the operation (e.g., fuel, drilling fluid additives, etc.). Additional traffic would be variable, depending on the phases of the drilling operation, but should average eight or nine vehicles per day per drill site throughout the drilling operation, with substantially higher peaks during rig set-up and relocation and during certain completion activities. Total rig-up activities and installation of ancillary facilities would take approximately three days to complete.

Drilling operations would be spread over the 20-year life of field development, with approximately 15 to 20 wells drilled each year. The number of wells drilled annually would depend on such factors as market prices, permit approval, and rig availability. Completion operations for each productive well would commence as soon as possible after the drilling rig moves off location.

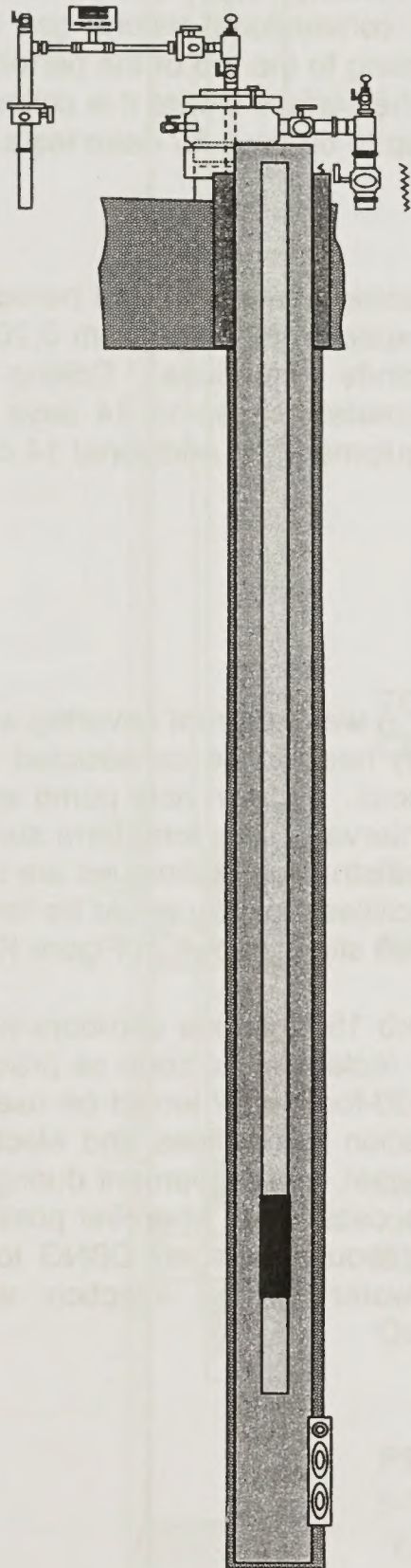
The geologic formations to be tested for conventional natural gas production in the project area are the Mesaverde and Almond Formations. The drilling depth may vary from 500 down to 10,000 feet for a conventional well drilled requiring approximately 20 to 30 days to drill vertically, barring any major drilling problems. Figure K-4 shows a completed well bore for a conventional gas well.

Water, for drilling and service trailer use, would be obtained from State of Wyoming approved locations or local water source wells. Water requirements for drilling conventional wells average approximately 11,000 barrels (bbls) per well (462,000 gallons). The Operators intend to use freshwater-based mud for the majority of their drilling operations.

Well completion operations involve the placement and cementing of well casing and perforation, stimulation and testing of potentially productive zones. Well casing involves running steel casing pipe into the open borehole and cementing the pipe in place. Perforation, stimulation, and testing require large equipment to be transported and used at the well site, and flaring of produced gas. A typical cased well bore would consist of conductor pipe, surface casing, and production casing. Well completion operations involve the placement and cementing of well casing.

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Well Name *Typical Conventional Well*
Field *Atlantic Rim*



Surface Casing

Size & Wt 9-5/8" 36#
Depth 370'
Cement: *Volume sufficient to circulate cement to surface*
Drill Bit Size 8-3/4"
Drill Depth 5,800'

Production Casing

Size & Wt 7" 23# or 5 1/2" 17# depending upon completion needs
Depth 5,800'
Cement: *Volume sufficient to isolate objective intervals*

Tubing

Size & Wt 2-7/8" 6.5#
Depth 5,650'
Packer *Type and need determined by production conditions*

Pump

Type *Type and need determined by production conditions*
Depth 5,650'

Perforated Interval

Length of interval and number of holes dependent upon thickness and number of prospective zones encountered

Figure K-4. Completed CBM Well Bore - Atlantic Rim Natural Gas Project.

APPENDIX K. PLAN OF DEVELOPMENT/ DETAILED PROPOSED ACTION

Surface casing would be set at the start of drilling operations to prevent gas, oil, condensate, or water from migrating from formation to formation, to isolate producing zones, to isolate and protect surface formations and to attach pressure control equipment. Setting and cementing of production casing provides separation and isolation from abnormally pressured zones, usable water zones, and other mineral deposits. The well casing would be perforated in the productive interval to allow the flow of hydrocarbons to the surface. Approximately 10,000 barrels of water may be required in the completing and testing operations per conventional natural gas well. Most completions use a string of tubing that is inserted in the casing to the top of the perforated productive zone to allow gas, condensate, and water to flow to the surface where it is collected, measured, and contained. Completion operations typically last up to 60 days for deep tests.

K.1.2.3.3 Injection Wells

Drilling of the injection wells would be accomplished with the same equipment and personnel used to drill the CBNG wells. Depth of the injection wells is expected to range from 3,200 to 6,400 feet in the Hatfield, Cherokee, and/or Deep Creek sands formations. Drilling and completion of each injection well is expected to take approximately seven to 14 days and installation of surface equipment, holding tanks and pumping equipment, an additional 14 days. A schematic of a typical injection well is shown in Figure K-5.

K.1.3 Production Operations

K.1.3.1 Well Production Facilities

Wellhead facilities would be installed if the wells are productive. A weatherproof covering would be placed over some wellhead facilities and a small shed may need to be constructed over others. The type and amount of gas dictates the design variances. A down hole pump would be used to produce water from the cased and perforated pay intervals. The long-term surface disturbance at each productive well location where cut and fill construction techniques are used would encompass approximately 1 acre. Well site production facilities typically would be fenced or otherwise removed from existing uses. A typical production well site is shown in Figure K-6.

Pipeline trenches for well gathering lines are expected to disturb 15-foot wide corridors within the 30-foot wide temporary construction ROW, which would be reclaimed as soon as practical after construction is completed. The remaining 15 feet of the 30-foot ROW would be used to transport machinery, personnel, and equipment for the installation of flowlines and electrical lines, as well as to give working room for the machinery, personnel, and equipment during the installation process. Trenches would be constructed along the access roads wherever possible. Separate gathering lines would be buried in the trenches and would transport CBNG to the metering facility and compressor station and produced water to the injection wells.

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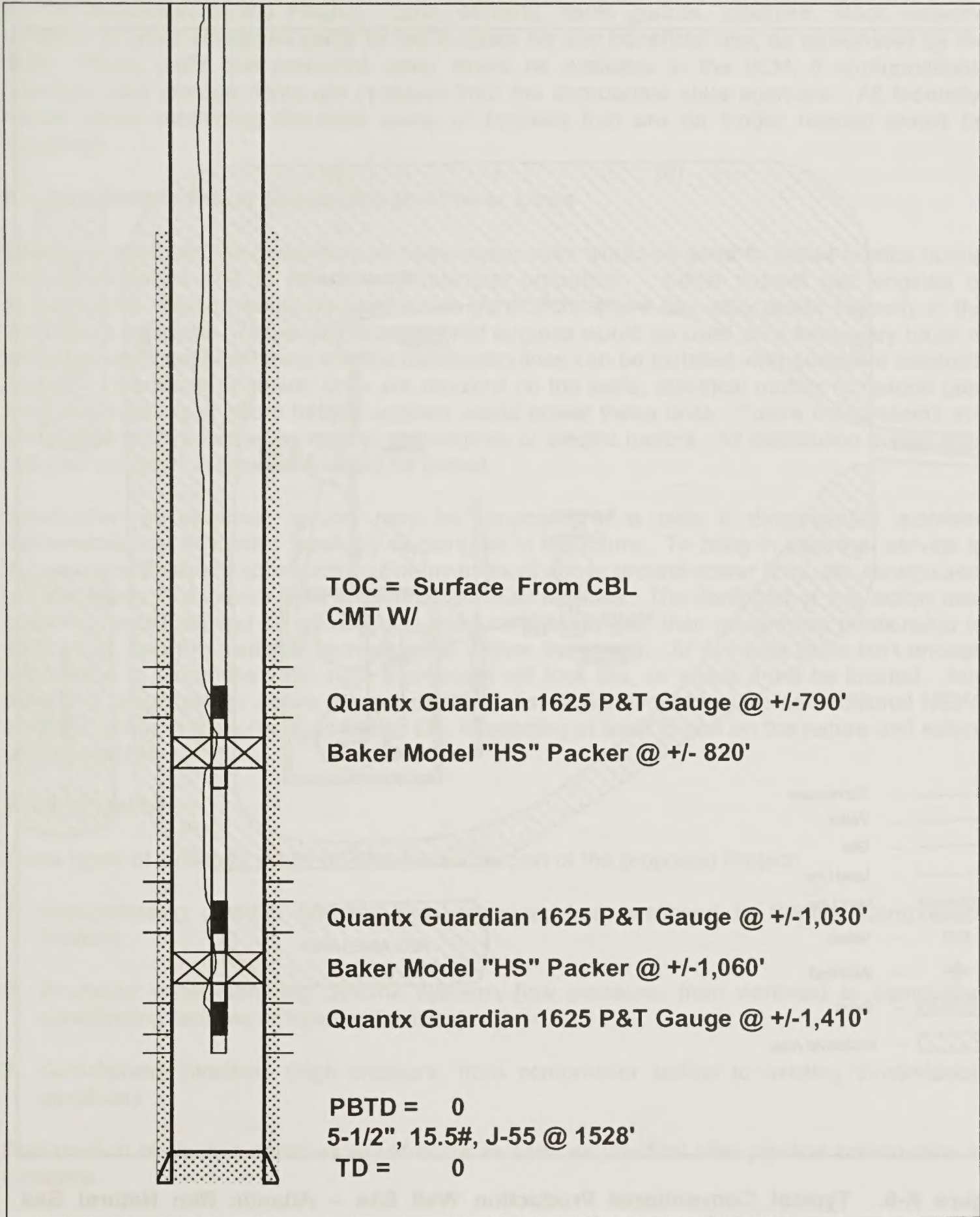


Figure K-5. Typical Pressure Monitoring Well Bore – Atlantic Rim Natural Gas Project.

APPENDIX K. PLAN OF DEVELOPMENT/ DETAILED PROPOSED ACTION

At the conclusion of the Project, roads, culverts, cattle guards, pipelines, stock watering facilities, or other structures could be left in place for any beneficial use, as designated by the BLM. Water wells and produced water would be available to the BLM, if appropriations, diversion, and storage rights are obtained from the appropriate state agencies. All federally-owned lands containing disturbed areas or facilities that are no longer needed would be reclaimed.

K.1.3.2 Electric Power Generation and Power Lines

Electricity produced via generators at compressor sites would be used to power pumps during well development and to initiate and maintain production. Either natural gas engines or propane-fired engines would be used to run generators where the utility power capacity in the area is not sufficient. These gas/propane fired engines would be used on a temporary basis at individual wells until additional electric distribution lines can be installed with adequate electrical capacity. If booster or blower units are required on the wells, electrical motors or natural gas-fired reciprocating or micro turbine engines would power these units. Future compressors are anticipated to be powered by natural gas engines or electric motors. All distribution power lines (12.5 kV or lower) in the ARPA would be buried.

Introduction of electrical service may be proposed at a later if development activities demonstrate the economic feasibility of doing so in the future. To bring in electrical service to the area would require construction of many miles of above ground power lines, the construction of substations and interior lines to centralized POD facilities. The likelihood of this action ever occurring would depend on which areas produce enough gas, their geographic relationship to each other, and the available technology to deliver the power. At this time there isn't enough information to determine what such a proposal will look like, or where it will be located. Any powerline proposals for above ground electrical distribution would require an additional NEPA analysis, either in the form of an EIS or EA, depending at least in part on the nature and extent of the proposal.

K.1.3.3 Pipelines

Three types of pipelines would be constructed as part of the proposed Project:

1. Gas-gathering pipeline systems (low pressure, from wellhead to Central Compressor Station).
2. Produced water-gathering pipeline systems (low pressure, from wellhead to centralized conditioning facilities or injection facilities).
3. Gas-delivery pipelines (high pressure, from compressor station to existing transmission pipelines).

Reclamation of pipeline corridors would occur as soon as practical after pipeline construction is complete.

APPENDIX K. PLAN OF DEVELOPMENT/ DETAILED PROPOSED ACTION

K.1.3.3.1 Gas-Gathering Pipeline Systems

Gas-gathering and produced water-gathering pipelines would be placed together in the same trench/ditch when practical. Construction and installation of pipelines would occur immediately upon determination of the well's capability to produce. The pipeline ROW would typically follow access roads, except in a limited number of cases where topography dictates or as required by the BLM. Separate gathering lines would be used to transport gas to production facilities and/or compressor stations and produced water to central conditioning facilities and/or injection facilities. Gathering lines average 2,640 feet in length (per productive well) and 30 feet in width after construction.

K.1.3.3.2 Produced-Water Gathering System and Disposal Facilities

The outcome of the Atlantic Rim Project will depend, in part, on the economical disposal of water produced in association with dewatering of CBNG. Produced water would primarily be disposed of by injection into a suitable aquifer via injection well (anywhere in the ARPA).

Predictions for water disposal volumes indicate that a minimum of one water disposal facility would be needed for each POD (12 wells/POD) in the early stages of field development. A water disposal facility would initially consist of one re-injection well, four fiberglass storage tanks, pump station, and a dehydration unit. A CBNG well would initially produce approximately 800 barrels of water per day and steadily decline to 10 barrels per day in three years.

Produced water-gathering pipelines would be constructed along the well access road wherever feasible, from the wellhead to the central conditioning/storage facilities. The water lines would be placed together in the same trench/ditch as gas gathering lines wherever practical, and buried. Both, typical water conditioning facility and a water disposal facility are shown in Figure K-7.

Transfer pumping stations would be used during production operations to transfer produced water from the CBNG well(s) to the injection facilities or the water conditioning sites. The transfer pumping stations are needed in those areas where elevation differences require supplemental pumping to transfer the produced water. If transfer pumping stations are required, they would be identified in the individual APDs or MSUP. Each pumping station would contain a

400-barrel water tank, an inlet separation vessel, and a small centrifugal water pump. Each pumping station would consist of a pad area having approximate dimensions of 100 feet by 100 feet, and disturbing an estimated 0.2 acre. An approximate two-foot berm would be constructed around the perimeter of each pumping station area to contain any potential water spills. A small pump house would be constructed immediately outside the bermed area to house the centrifugal pump. A typical water transfer facility is shown in Figure K-8.

K.1.3.3.2.1 Surface Disposal

No surface disposal is proposed. Limited use of closed livestock and wildlife watering systems may occur, but will not be used to dispose of produced water.

K.1.3.3.2.2 Subsurface Disposal

Subsurface disposal of produced water would be used in the ARPA. Produced water from individual wells would be gathered and routed to centralized water handling and storage sites,

APPENDIX K. PLAN OF DEVELOPMENT/ DETAILED PROPOSED ACTION

which would serve as central injection facilities (Figure K-7). The centralized facilities would be approved, as required, by the BLM, WOGCC, SEO, and WDEQ and would each be located offsetting injection or re-injection well(s). Facilities would location share wherever possible.

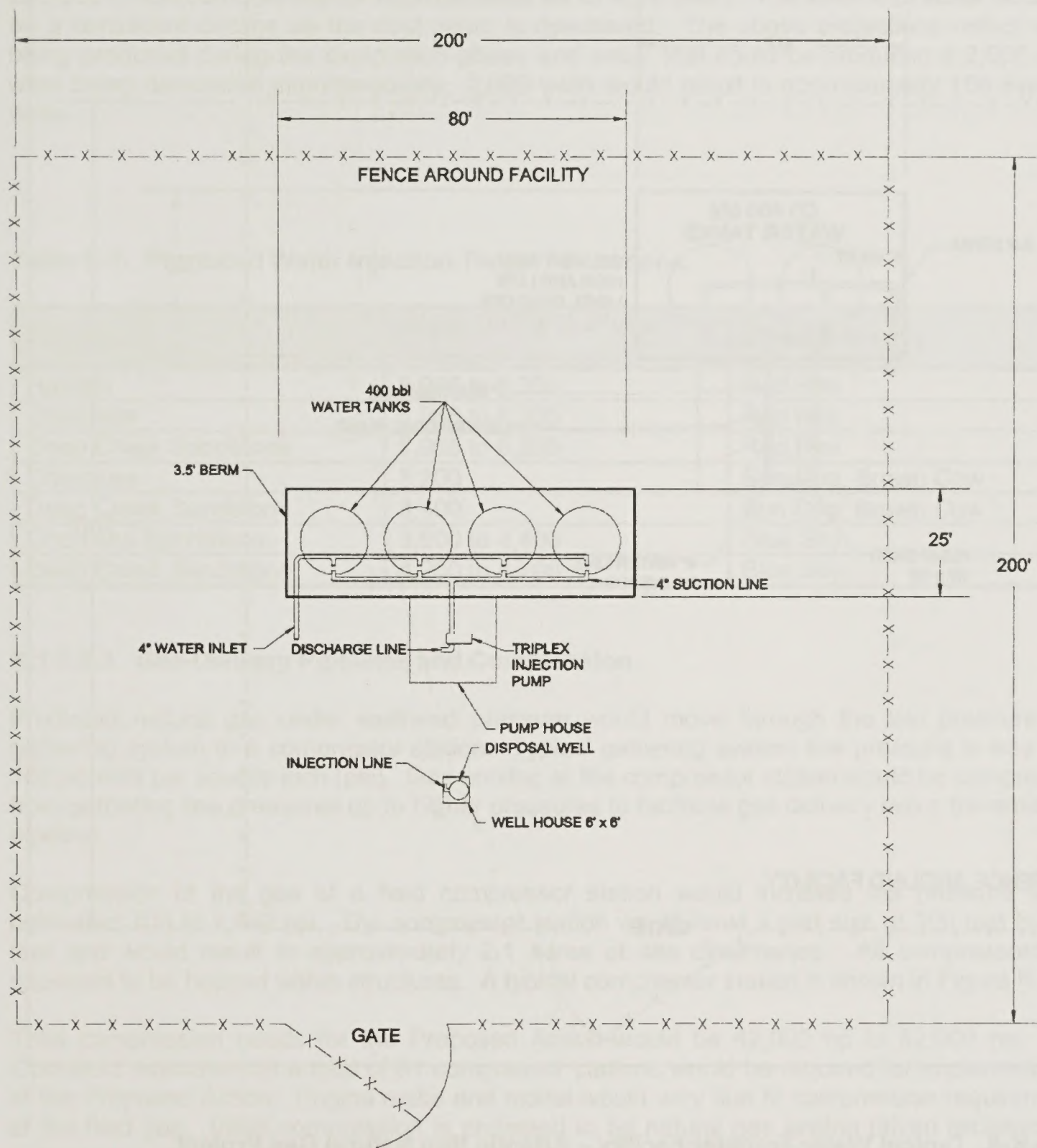


Figure K-7. Typical Water Conditioning and Disposal Facility – Atlantic Rim Natural Gas Project.

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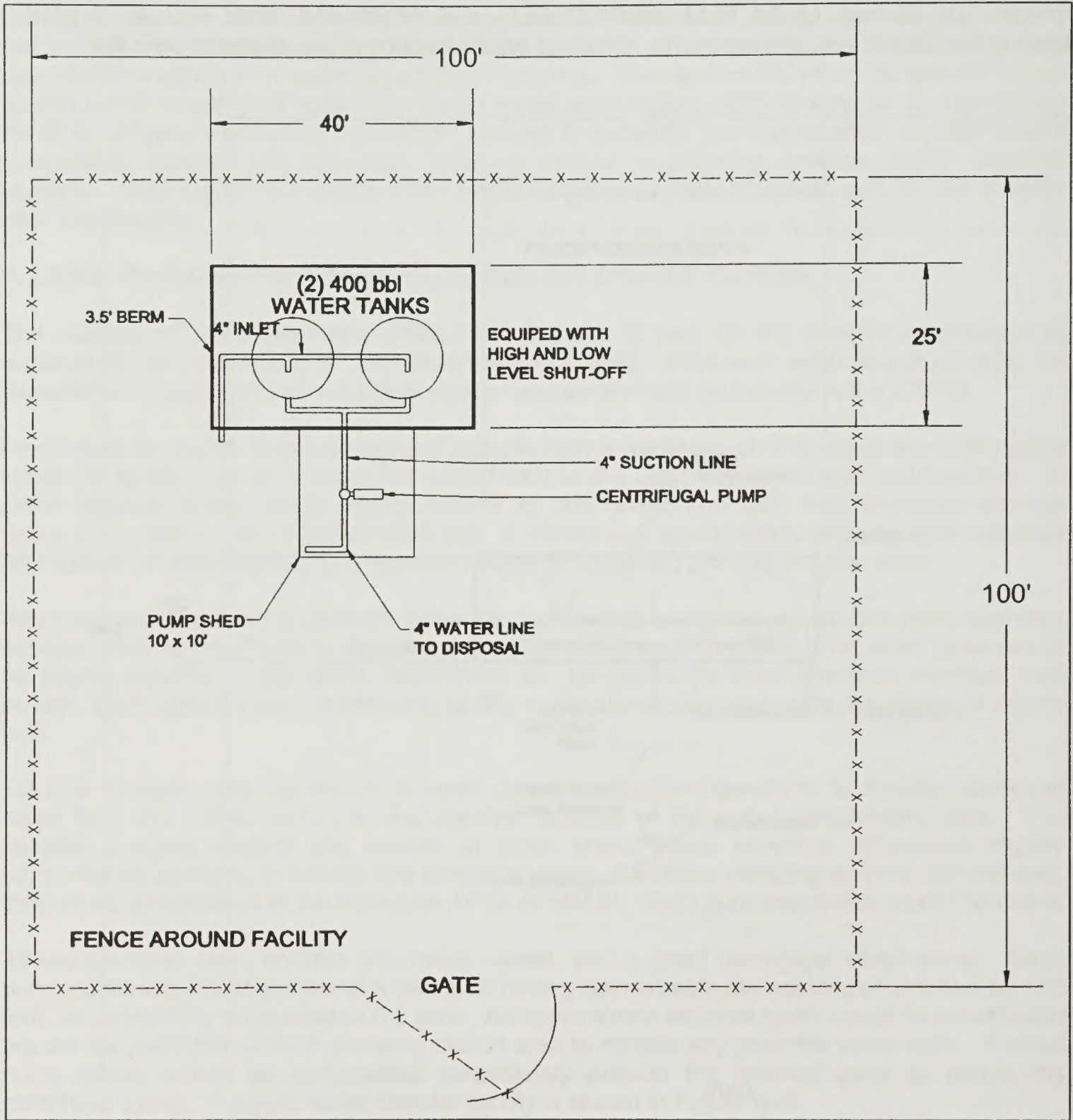


Figure K-8. Typical Water Transfer Facility – Atlantic Rim Natural Gas Project.

Formations targeted for injection of produced water are shown in Table K-1, based upon interim POD information.

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Each deep injection well would have an approximate minimum injection capacity of 5,000 bbls/day and maximum injection capacity of 15,000 bbls/day. A predicted total project volume of produced water in the best success scenario for the proposed well development would be 250,000 to 450,000 bbls/day for approximately six to eight years. The volume of water would be on a consistent decline as the coal seam is dewatered. The above projections reflect water being produced during the exploration phase and water that could be produced if 2,000 wells were being dewatered simultaneously. 2,000 wells would result in approximately 166 injection wells.

Table K-1. Produced Water Injection Target Formations.

Formation	Depth Below Surface, Feet	POD Reference
Hatfield	5,965 to 6,335	Red Rim
Cherokee	5,965 to 6,335	Red Rim
Deep Creek Sandstone	5,965 to 6,335	Red Rim
Cherokee	3,200	Sun Dog, Brown Cow
Deep Creek Sandstone	3,400	Sun Dog, Brown Cow
Cherokee Sandstone	3,900 to 4,400	Blue Sky
Deep Creek Sandstone	4,200 to 4,700	Blue Sky

K.1.3.3.3 Gas-Delivery Pipelines and Compression

Produced natural gas under wellhead pressure would move through the low pressure gas gathering system to a compressor station. Typical gathering system line pressure is less than 100 pounds per square inch (psi). Gas arriving at the compressor station would be compressed from gathering line pressures up to higher pressures to facilitate gas delivery into a transmission pipeline.

Compression of the gas at a field compressor station would increase the pressure to an estimated 700 to 1,440 psi. The compressor station would have a pad size of 300 feet by 300 feet and would result in approximately 2.1 acres of site disturbance. All compressors are expected to be housed within structures. A typical compressor station is shown in Figure K-9.

Total compression needs for the Proposed Action would be 42,000 hp to 52,000 hp. The Operators estimate that a total of 61 compressor stations would be required for implementation of the Proposed Action. Engine make and model would vary due to compression requirements of the field gas. Initial compression is projected to be natural gas engine driven reciprocating compressor units meeting best available control technology (BACT) requirements of WDEQ-AQD. Each compressor station would also have a 1,206 hp natural gas fired generator (Cat 3516TA rich-burn with NSCR catalyst) for electric power production. Once electric power is available on-site compression would change over to electrically driven.

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K.1.3.4 Ancillary Facilities

All wells, pipelines, and associated ancillary production facilities would be operated in a safe manner by the Operators, as set forth by standard industry operating guidelines and procedures. Routine maintenance of producing wells would be necessary to maximize performance and detect potential difficulties with gas production operations. Each well location would be visited about every other day to ensure operations are proceeding in an efficient and safe manner. The visits would include checking gauges, valves, fittings, and onsite storage of produced water. Routine onsite equipment maintenance would also be performed as necessary. Additionally, all roads and well locations would be regularly inspected and maintained to minimize erosion and assure safe operating conditions.

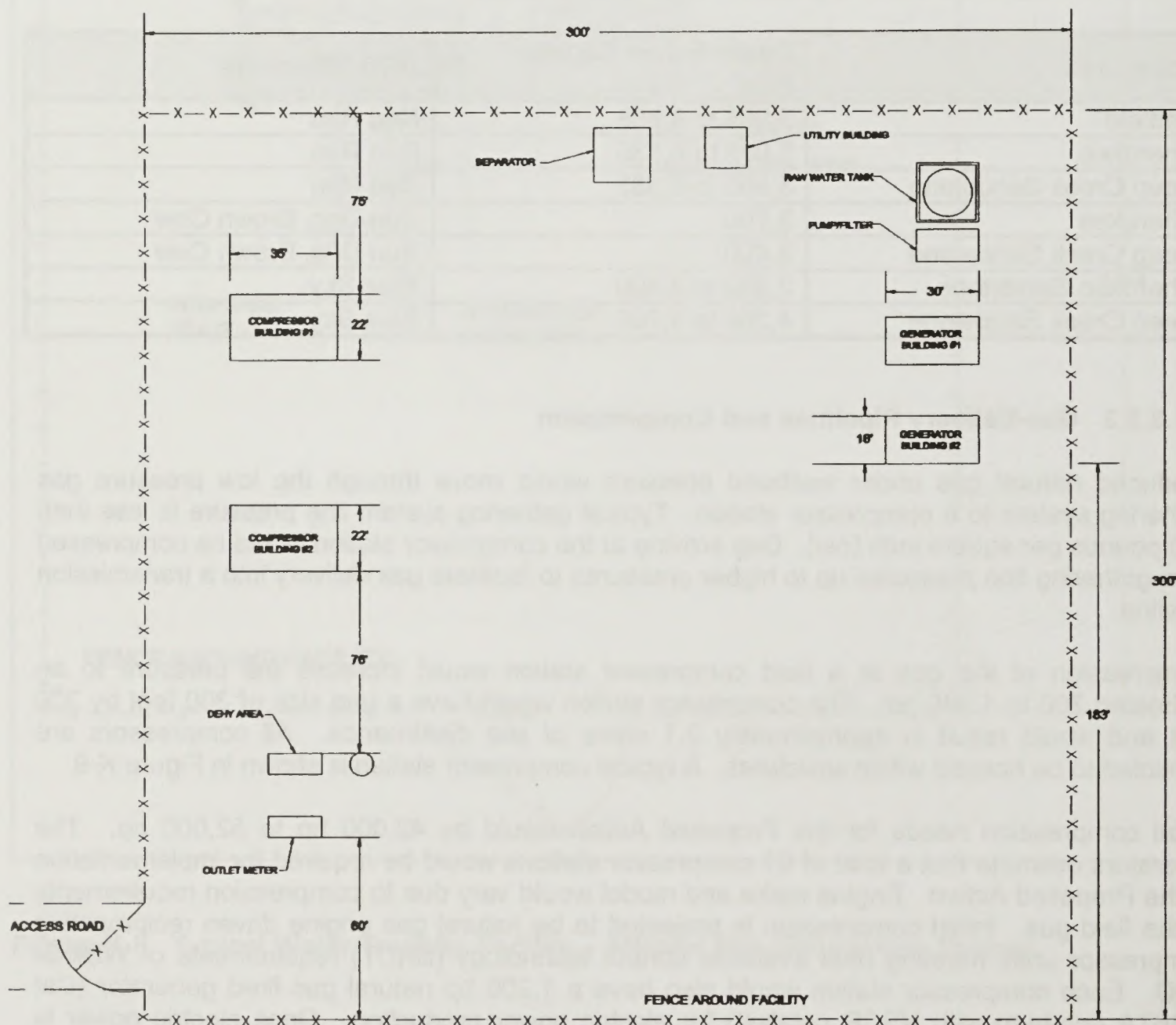


Figure K-9. Typical Compression Facility – Atlantic Rim Natural Gas Project.

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K.1.3.5 Traffic and Work Force Estimates

Estimated traffic requirements for drilling, completion, and field development operations are shown in Table K-2. The 'Trip Type' column lists the various service and supply vehicles that would travel to and from the well sites and production facilities. The 'Round-Trip Frequency' column lists the number of trips, both external (i.e., to/from the Project Area) and internal (within the Project Area). The figures provided in Table K-2 should be considered general estimates. Drilling and production activity levels may vary over time in response to weather and other factors.

Table K-2. Traffic Estimates.

Trip Type	Round-Trip Frequency	
	External (to/from Project Area)	Internal (within Project Area)
Drilling (2 rigs, 2 crews/rig)		
Rig supervisor	4/day	same
Rig crews	4/day	same
Engineers ^a	2/week	1/day/rig
Mechanics	4/week	same
Supply delivery ^b	1/week	2-4/day
Water truck ^c	3/week	2 round trips/day
Fuel trucks	4 round trips/well	same
Mud trucks ^d	1/week	2/day
Rig move ^e	8 trucks/well	8 trucks/well
Drill bit/tool delivery	2/ weeks	same
Completion		
Small rig/crew	4/day	same
Cement crew	2 trips/well	same
Consultant	1/day	same
Well loggers	3 trips/well	same
Gathering systems	2/day	same
Power systems	2/day	same
Compressor stations	2/day	same
Other field development	2/day	same
Testing and operations	2/day	same

Notes:

- ^a Engineers travel to Project Area weekly and stay in a trailer at the Project Area during the week.
- ^b Current plans are to establish a central supply area within a Project Area and deliver supplies on a weekly basis.
- ^c Water trucks would deliver water to rigs from a location within the Project Area.
- ^d Current plans are to establish a central mud location within a Project Area and deliver mud on a weekly basis.
- ^e It would require eight trucks to move each rig to a Project Area. Upon completion of drilling in a Project Area, each rig would move to the next Project Area.

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K.1.3.6 Site Restoration and Abandonment

The Operators propose to completely reclaim in the interim all disturbed areas not needed for production activities. Reclamation would generally include: 1) complete cleanup of the disturbed areas (drill sites, access roads, etc.), 2) restoration of the disturbed areas to the approximate ground contour that existed prior to construction, 3) replacement of topsoil over all disturbed areas, 4) ripping of disturbed areas to a depth of 12 to 18 inches, and 5) seeding of re-contoured areas with a BLM approved, certified weed-free, seed mixture.

Specific reclamation recommendations for use with the natural gas drilling and production operations within the project area are described in the Reclamation Plan (Appendix B). The final set of reclamation measures to be applied would be developed in the APD or ROW grant by each operator in consultation with the BLM and would be specific to each site and the conditions at that site.

K.1.3.7 Applicant Voluntarily Committed Measures

Following are applicant committed measures to avoid or mitigate resource or other land use impacts. An exception to a mitigation measure and/or design feature may be approved on a case-by-case basis when deemed appropriate by the BLM or in conjunction with the surface owner. An exception would be approved only after a thorough, site-specific analysis determined that the resource or land use for which the measure was put in place is not present or would not be significantly impacted. The Operators propose to implement resource-specific mitigation measures on all lands within the ARPA including federal, State and private (fee) surface ownership:

K.1.3.7.1 Preconstruction Planning and Design Measures

The Operators and the BLM would make on-site Interdisciplinary (ID) reviews of each proposed and staked facility site (e.g., well sites), new access road, access road reconstruction, and pipeline alignment projects so that site-specific recommendations and mitigation measures can be developed.

- New road construction and maintenance of existing roads in the ARPA would be accomplished in accordance with BLM Manual 9113 standards unless private landowners or the State of Wyoming specify otherwise on their lands.
- Consistent with the annual work planning described in section K.1.1, The Operators would prepare and submit an APD for each drill site on federal leases to the BLM for approval prior to initiation of construction. Also prior to construction, the Operators or their contractors would submit a Sundry Notice and/or ROW application for each pipeline and access road segment on federal leases. The APD would include a Surface Use Plan that would show the layout of the drill pad over the existing topography, dimensions of the pad, volumes and cross sections of cut and fill, location and dimensions of reserve pit, and access road egress and ingress. The APD, Sundry Notice, and/or ROW application plan would also itemize project administration, time frame, and responsible parties. In addition, a reclamation plan would be developed by the operators for each facility in consultation with the BLM. APD packages would be submitted annually on April 1, including GIS data specified in K.1.1, for planning and analysis for the upcoming work year.

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K.1.3.7.2 Resource-Specific Requirements

Geology/Minerals

Mitigation measures presented in the Soils and Water Resources sections would avoid or minimize many of the potential impacts to the surface mineral resources. Protection of subsurface mineral resources from adverse impacts would be provided by the BLM and/or WOGCC casing and cementing policy.

Climate and Air Quality

- The Operators would not burn garbage or refuse at the drill sites or other facilities.
- When an air quality, soil loss, or safety problem is identified as a result of fugitive dust, immediate abatement would be initiated.

Soils and Water Resources

- Reduce the area of disturbance to the absolute minimum necessary for construction and production operations while providing for the safety of personnel. The Operators would prohibit off-road vehicle activity.
- Generally, buried pipelines would be located immediately adjacent to roads to avoid creating separate areas of disturbance and in order to reduce the total area of disturbance.
- The operators would avoid using frozen or saturated soils as construction material.
- The operators would minimize construction activities in areas of steep slopes and other sensitive soils, and apply special slope stabilizing structures if construction cannot be avoided in these areas.
- Design cut slopes in a manner that would allow retention of topsoil, surface treatment such as mulch, and subsequent revegetation.
- Selectively strip and salvage topsoil or the best suitable medium for plant growth from all disturbed areas on all well pads.
- Where possible, minimize disturbance to vegetated cuts and fills on existing roads that are improved.
- Install runoff and erosion control measures such as water bars, berms, and interceptor ditches if needed.
- Implement minor routing variations during access road layout to avoid steep slopes adjacent to ephemeral or intermittent drainage channels. Maintain a buffer strip of natural vegetation where possible (not including wetland vegetation) between all construction activities and ephemeral and intermittent drainage channels.

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- Include adequate drainage control devices and measures in the road design (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipaters) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid erosive concentrated flows. In conjunction with surface runoff or drainage control measures, use erosion control devices and measures such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. Implement a revegetation program as soon as possible to re-establish the soil protection afforded by a vegetal cover.
- Upon completion of construction activities, restore topography to near pre-existing contours at the well sites, along access roads and pipelines, and other facilities sites. Replace topsoil or suitable plant growth material over all disturbed surfaces, and apply fertilizer as needed, and seed.
- When feasible, limit construction of drainage crossings to no-flow periods or low-flow periods.
- Minimize the area of disturbance within ephemeral and intermittent drainage channel environments.
- Avoid construction of well sites, access roads, and pipelines within 500 feet of surface water and/or riparian areas. Exceptions to this would be granted by the BLM based on an environmental analysis and site-specific mitigation plans.
- Design channel crossings to minimize changes in channel geometry and subsequent changes in flow hydraulics.
- Construct channel crossings for buried pipelines such that the pipe is buried a minimum of four feet below the channel bottom.
- Regrade disturbed channel beds to the original geometric configuration with the same or very similar bed material.
- Case wells during drilling, and case and cement all wells in accordance with State, and/or Federal regulations to protect accessible high quality aquifers. High quality aquifers are aquifers with known water quality of 10,000 ppm TDS or less. Include well casing and welding of sufficient integrity to contain all fluids under high pressure during drilling and well completion. Further, wells would adhere to the appropriate BLM or WOGCC cementing policy.
- Reserve pits would be constructed so that a minimum of one-half of the total depth is below the original ground surface on the lowest point within the pit. To prevent seepage of fluids, drilling mud gel or poly liners would be used as needed to line reserve pits in areas where subsurface material would not contain fluids. Liners would be of sufficient strength and thickness to withstand normal installation and use. The liner would be impermeable (i.e., having a permeability of less than 10^{-7} cm/sec) and chemically compatible with all substances which may be put in the pit.
- Maintain 2 feet of freeboard on all reserve pits to ensure the reserve pits are not in danger of overflowing. Shut down drilling operations until the problem is corrected if leakage is found outside the pit.

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- Extract hydrostatic test water used in conjunction with pipeline testing and all water used during construction activities from sources with sufficient quantities and through appropriation permits approved by the State of Wyoming.
- Discharge hydrostatic test water in a controlled manner onto an energy dissipator. The water is to be discharged onto undisturbed land that has vegetative cover, if possible, or into an established drainage channel. Prior to discharge, treat or filter the water to reduce pollutant levels or to settle out suspended particles if necessary. If discharged into an established drainage channel, the rate of discharge would not exceed the capacity of the channel to safely convey the increased flow. Coordinate all discharge to test water with the SEO and the BLM.
- Develop and implement a Storm Water Pollution Prevention Plan (SWPPP) for storm water runoff at drill sites as required per WDEQ storm water NPDES permit requirements.
- The Operators must coordinate with the Corps of Engineers (COE) to determine the specific Clean Water Act (CWA) Section 404 Permit requirements and conditions (including the potential requirement of compensatory mitigation) for each facility that occurs in Waters of the U.S. to prevent the occurrence of significant impact to such waters.
- Exercise precautions against pipeline breaks and other potential accidental discharges of toxic chemicals into adjacent streams. If liquid petroleum products storage capacity exceeds criteria contained in 40 CFR Part 112, a Spill Prevention Control and Countermeasures (SPCC) plan would be developed in accordance with 40 CFR Part 112.
- The project must comply with all applicable requirements of the CWA, including the requirement to obtain an WYPDES permit.

Vegetation and Wetlands

- Seed and stabilize disturbed areas with mixtures and treatment guidelines prescribed in the approved APD, ROW, or surface landowner requirements.
- Evaluate all project facility sites for occurrence and distribution of waters of the U.S., special aquatic sites, and jurisdictional wetlands. All project facilities would be located out of these sensitive areas. If complete avoidance is not possible, minimize impacts through modification and minor relocations. Coordinate activities that involve dredge or fill into wetlands with the COE.
- Conduct site-specific surveys for federally listed threatened and endangered (T&E) and candidate plant species prior to any surface disturbance in accordance with the Endangered Species Act.

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Range Resources and Other Land Uses

- The Operators would coordinate with the affected livestock operators to ensure that livestock control structures remain functional during drilling and production operations.

Wildlife

- During reclamation, establish a variety of forage species that are useful to resident herbivores by specifying the seed mixes in the approved APD, ROW or surface landowner requirements.
- Discourage unnecessary off-site activities of operational personnel in the vicinity of the drill sites.

Visual Resources

- Paint all structures with non-reflective colors that blend with the adjacent landscape, except for structures that require safety coloration in accordance with Occupational Safety and Health Administration (OSHA) requirements.

Cultural Resources

- If a site is considered eligible for, or is already on the National Register of Historic Places (NRHP), avoidance is the preferred method for mitigating adverse effects to that property.

Socioeconomics

- Coordinate project activities with ranching operations to minimize conflicts involving livestock movement or other ranch operations. This would include scheduling of project activities to minimize potential disturbance of large-scale livestock movements. Establish effective and frequent communication with affected ranchers to monitor and correct problems and coordinate scheduling.

Health and Safety

- The operators will establish and maintain an appropriate safety program for the intended work which will comply with all applicable Federal, State and local regulations, including but not limited to, RCRA, SPCC, SARA, Hazardous Substance Management.

APPENDIX K. PLAN OF DEVELOPMENT/ DETAILED PROPOSED ACTION

Table K-3. Types and Approximate Acreage of Surface Disturbance by Surface Ownership of the Proposed Action.

Proposed Action									
Atlantic Rim Project Disturbance - Acres									
Type	Life of Project Disturbance				Initial Disturbance				
	Federal	Private	State	Total	Federal	Private	State	Total	
Coalbed NG	1,152	558	90	1,800	2,304	1,116	180	3,600	
Conventional NG	333	161	26	520	564	273	44	882	
Total Wellpad	1,485	719	116	2,320	2,868	1,389	224	4,482	
Roads / Utilities*	2,327	1,127	182	3,636	6,206	3,006	485	9,697	
Pipelines	0	0	0	0	93	45	7	145	
Ancillary Facilities	182	88	14	285	947	458	74	1,479	
Totals	3,994	1,935	312	6,241	10,114	4,899	790	15,803	

Assumptions Used to Calculate the Proposed Action Disturbance Acreage

Assumptions	Amount	Unit	Assumptions	Amount	Unit
Acres / well pad Short Term -Coal Bed	2	Acres	Coal Bed NG Wells	1800	Wells
Acres / well pad Long Term - Coal Bed	1	Acres	Conventional NG Wells	200	Wells
Acres disturbance / well pad Short Term -Conventional	4.41	Acres	Total Number of Wells Analyzed	2000	Wells
Acres disturbance / well pad Long Term -Conventional	2.6	Acres	% Federal Development	64	%
Drilling Success Rate	100	%	% Private Development	31	%
Miles / Well pad, avg*	0.5	Miles	% State of Wyoming Development	5	%
Disturbance width, Roads & Utilities - initial	80	Feet	Ancillary Facilities - initial disturbance	1479	Acres
Disturbance Width, Roads & Utilities - LOP	30	Feet	Ancillary Facilities - LOP disturbance	285	Acres
Pipelines Outside Road Corridors	15	Miles			

*well pad roads, collector roads and new arterial roads are considered in this figure.

Other than the asterisked number, all numbers (averages) used in the assumption chart are taken from actual field inspections conducted the summer of 2005 for both CBNG and conventional gas wells (BLM, 2005).

Appendix L

Resource Concerns and Associated Protection Measures Proposed Under Alternative C

**APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES
PROPOSED UNDER ALTERNATIVE C**

APPENDIX L

**RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES
PROPOSED UNDER ALTERNATIVE C**

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
Steep Slopes >25%, from 30 meter DEM data. These steeper slopes present more complexity in planning, road design, and can require larger pads. (appendix M, map M-39, Alternative C - Slopes Greater than 25%).	1) No pad, compressor or water transfer sites can be located in these areas.	Wyoming Standard Mitigation Guidelines
Perennial Waters, Wetlands, Identified on National Wetlands Inventory or PFC with 500 ft. Buffer on waters and PFC. (appendix M, map M-15, Alternative C—Perennial Surface Waters and Wetlands).	1) No pad, compressor or water transfer sites can be located in these areas.	EO 11990 and 11988

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Water and Soil Management		
<p>Topsoils with excess salts providing difficulty with reclamation. Reclamation success is essential for modification of impacts to surface hydrology, especially the interim reclamation. Increasing reclamation success has many benefits to other resources. (appendix M, map M-9, Top Soils with Excess Salts)</p>	<ol style="list-style-type: none"> 1) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant first good season, interim reclamation will be completed one year after spud date. 2) Low impact road design for resource roads (roads into individual pads) on slopes < 5%, if road can be built with no side slopes. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel. 3) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year. 4) Put together seed mix that includes salt tolerant plants. 	<p>Cumulative Impacts; Salinity concerns in the Colorado River Basin.</p>
<p>Soils with high runoff potential contribute to higher peak flows and can cause hillslope erosion by forming rills and gullies. (appendix M, map M-38, Soils with High Runoff Potential).</p>	<ol style="list-style-type: none"> 1) Reduce pad density to 4 locations per section and the associated infrastructure and limit initial disturbance (i.e. short-term) total to < 20 acres per section. 2) Place waddles in any potential flow path and at culvert entrances and exits. 3) Deep ripping (18 inches or more) before planting to increase percolation. 4) Closed system, pitless, or shared pit drilling. 5) Low impact road design for resource roads (roads into individual pads) on slopes < 5%. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel. 6) Certified weed-free native hay, straw mulch or other appropriate mulch to increase surface roughness. 	<p>Cumulative Impacts; the Colorado River Basin has been a focus for sediment delivery and soil loss since the 1930s.</p>

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
	Water and Soil Management	
Soils with severe road rating typically dominated by one soil particle size component and road bases can become very unstable with insufficient maintenance. (appendix M, map M-11, Soils with Severe Road Rating).	<ol style="list-style-type: none"> 1) Low impact road design for resource roads (roads into individual pads) on slopes < 5%. This will include ditch-witching utilities within the ROW, brush beating, some type of fabric or matting and gravel. 2) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year. 	Cumulative Impacts; the Colorado River Basin has been a focus for sediment delivery and soil loss since the 1930s.
Soils with poor topsoil ratings make reclamation difficult and can leave soils susceptible to erosion. Reclamation success is essential for modification of impacts to surface hydrology, especially the interim reclamation. Increasing reclamation success has many benefits to other resources. (appendix M, map M-13, Soils with Poor/Fair Topsoil Ratings).	<ol style="list-style-type: none"> 1) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant 1st good season, interim reclamation will be completed 1 year after spud date. 2) Crimped weed-free hay stubble mulch to increase surface roughness. 3) Use silt fencing to reduce wind erosion during construction. 4) Apply soil amendments to increase reclamation success unless testing demonstrates no need for amendments. 	Cumulative Impacts; the Colorado River Basin has been a focus for sediment delivery and soil loss since the 1930s.
	Vegetation Resources	
Vegetation communities on >8% slopes present reclamation difficulties. (appendix M, maps M-19 and M-46).	Reduced initial surface disturbance (i.e., short-term) total to < 20 acres per section.	
The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration. (appendix M, map M-19, Vegetation Communities).	<ol style="list-style-type: none"> 1) Avoid surface disturbances within aspen, juniper-woodland, mahogany, and serviceberry communities. 	Standards and Guidelines Assessment for Upper Colorado River Basin (USDI-BLM 2002a)

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Rangeland Resources		
Loss of livestock; disruption of management operations	<ol style="list-style-type: none"> 1) Operators shall establish and enforce speed limits throughout the project area. 2) Erect signs in lambing/calving areas, shipping pastures, or adjacent to working corrals to warn vehicle operators. 	
Disruption of management operations. (appendix M, map M-20, Grazing Allotments).	<ol style="list-style-type: none"> 1) Operators shall provide a plan specific to pastures or regions so livestock operators can plan activities/work around development to reduce conflicts. 	
Dust on vegetation and erosion	<ol style="list-style-type: none"> 1) Improve road surface on newly constructed or improved local and collector roads with 95% compaction on the road base and non-chlorine dust abatement product or suitable alternative treatment each year. 	
Wildlife Resource Management		
Disturbance of greater sage-grouse and Columbian sharp-tailed grouse nesting & brood rearing habitat. (appendix M, map M-47, Alternative C--Greater Sage-Grouse Nesting and Brood-Rearing Habitat).	<ol style="list-style-type: none"> 1) Limit initial disturbance (i.e. short-term) total to < 20 acres per section. 	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004)
Disturbance of winter relief habitats for greater sage-grouse and Columbian sharp-tailed grouse. (appendix M, map M-48, Alternative C--Grouse Critical Wintering Areas).	<ol style="list-style-type: none"> 1) No surface disturbance. 	Vegetation and Habitat Analysis of Critical Wintering Areas for Greater Sage-Grouse (HWA 2004)
Disturbance of big game crucial winter range. (appendix M, maps M-21, 23, and 24; Seasonal Pronghorn, Mule Deer and Elk Ranges and Migration Routes).	<ol style="list-style-type: none"> 1) Limit initial disturbance (i.e. short-term) total to < 20 acres per section. 	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004)

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Visual Resource Management		
Failure to use special mitigations will result in a project that will exceed VRM Class III Management Objectives and therefore be out of compliance with Land Use Planning guidance. Minimizing surface disturbance and aboveground facilities will help minimize visual impacts. Maximizing facility distance from primary roads will help minimize visual impacts. Using any topographic screening available to hide facilities and roads will help minimize visual impacts.	<p>In visible portions of VRM Class III areas (map M-6), the following apply:</p> <ol style="list-style-type: none"> 1) Pads shall not be located on or near ridgelines - use subsurface or low-profile facilities to prevent protrusion above horizon line when viewed from any state, county or BLM road. 2) Maximize pad distance from state, county or BLM roads. 3) Low impact road design for resource roads (roads into individual pads) on slopes < 5%, if road can be built with no side slopes. This will include ditch-watching utilities within the ROW, brush beating, some type of fabric or matting and gravel. 4) Minimize pad size - use pitless, shared pit or closed system drilling. 5) Pump reserve pit and do earth work for reclamation right after drilling, put in top soil and plant first good season, interim reclamation will be completed one year after spud date. 	VRM BMPs for Fluid Minerals, VRM H-8400-1, Land Use Planning H-1601-1
Historic Trails		
Historic trails and associated site setting	<ul style="list-style-type: none"> • Relocate project or hide disturbance. • No surface occupancy of JO Ranch or surrounding 250 acres. • Use matting on rights-of-way during construction to minimize surface disturbance and visibility. • Brush hog rights-of-way. • Allow no surface disturbance within ¼ mile of contributing segments of historic trails or trail associated sites. • Limit trail crossings to existing disturbance corridors or non-contributing segments unless otherwise determined by BLM in consultation with SHPO. • No surface occupancy of JO Ranch or surrounding 250 acres. 	Wyoming State Protocol—Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800
Historic trails Physical trace and associated sites		Wyoming State Protocol—Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Cow Butte/Wild Cow SMA		
Existing road network (appendix M, map M-34 Special Management Areas (SMAs Overview)).	<ol style="list-style-type: none"> 1) Road density within the SMA targeted for less than 3 miles/mile². 2) Where existing road paths do not provide sufficient lease access or are located within highly erosive soils or in proximity to sensitive wildlife resources, reclamation of existing roads (either inside or outside the ARPA) would provide for the construction of new road paths. 3) Improvement of existing roads or construction of new roads would be designed to minimize hydrologic alteration. Specific road design criteria would be based on site-specific review and likely include a combination of mitigation options. 	<p>Standards and Guidelines Assessment for Upper Colorado River Basin (USDI-BLM 2002a). These roads are currently known to cause accelerated erosion and hydrologic alteration. Upgrading these roads to improved or low-impact design specifications would decrease these impacts while allowing vehicular access to lease holdings. Additionally, utilization of appropriate road designs would increase the effectiveness of the existing transportation network.</p>
Human presence	<ol style="list-style-type: none"> 1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be gated. 2) Remote monitoring of well locations would be required where feasible. 	<p>Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA. Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.</p>

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Cow Butte/Wild Cow SMA		
Wildlife movements	<ol style="list-style-type: none"> Convert fences to BLM standards or designs (e.g., rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees. 	Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a). Improving big game movement through or across fences would help to mitigate the additional stresses of development within the ARPA.
Limited vegetation communities. (appendix M, map M-19, Vegetation Communities).	<ol style="list-style-type: none"> No surface disturbances within aspen, mahogany, and serviceberry communities. 	Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a)
Upper Muddy Creek Watershed/Grizzly SMA		
Additional road development would alter hydrologic conditions that create and maintain key habitat features of importance to BLM sensitive fishes (Bower 2005). Given the limited distribution of these fishes, alteration of the suitability of habitats within the SMA would likely increase the validity of listing petitions under the Endangered Species Act. (appendix M, map M-34, SMAs Overview).	<ol style="list-style-type: none"> Road density within the SMA targeted for less than 3 miles/mile². Transportation and well access roads would utilize existing road paths where feasible. Where existing road paths do not provide sufficient lease access or are located within highly erosive soils or in proximity to sensitive wildlife resources, reclamation of existing roads within the SMA (either inside or outside the ARPA) would provide for the construction of new road paths. Improvement of existing roads or construction of new roads would be designed to minimize hydrologic alteration. Specific road design criteria would be based on site-specific review and likely include a combination of mitigation options. Detailed development, transportation, and reclamation plans, including road design, specific to those areas within the SMA will be required. 	BLM Wyoming Sensitive Species List (USDI-BLM 2002b), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i> , Bluehead Sucker, <i>Catostomus discobolus</i> , and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). These roads are currently known to cause accelerated erosion and hydrologic alteration. Upgrading these roads to improved or low-impact design specifications would decrease these impacts while allowing vehicular access to lease holdings. Additionally, utilization of appropriate road designs would increase the effectiveness of the existing transportation network.

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Upper Muddy Creek Watershed/Grizzly SMA		
<p>Slopes > 8% within the Upper Muddy Creek Watershed/Grizzly SMA boundary from 30-m DEM. Road construction on steep slopes would exacerbate the alteration of hydrologic conditions that create and maintain key habitat features of importance to BLM sensitive fishes. (appendix M, map M-46, Alternative C—Muddy Creek SMA Slopes >8%).</p>	<p>Upper Muddy Creek Watershed/Grizzly SMA</p> <ol style="list-style-type: none"> 1) No surface disturbance. 2) Detailed transportation plan required in order to avoid areas of > 8% slope. 	<p>BLM Wyoming Sensitive Species List (USDI-BLM 2002b), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i>, Bluehead Sucker, <i>Catostomus discobolus</i>, and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). Improved road designs frequently result in alteration of hydrologic conditions. Given the limited feasibility of utilizing low-impact road designs on slopes greater than 8%, these areas will be avoided.</p>
<p>1:24,000 NHD within the Upper Muddy Creek Watershed/Grizzly SMA boundary. The fragmentation of fish habitats and wildlife corridors as well as risks posed by the increased probability of exotic species introductions warrant avoidance of additional road crossings of Muddy Creek.</p>	<ol style="list-style-type: none"> 1) No new road crossings of Muddy Creek. 2) Detailed development and transportation plan required in order to design access routes that avoid Muddy Creek. 	<p>BLM Wyoming Sensitive Species List (USDI-BLM 2002a), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i>, Bluehead Sucker, <i>Catostomus discobolus</i>, and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). Sufficient access to lease holdings can be provided through the transportation planning process.</p>

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Upper Muddy Creek Watershed/Grizzly SMA		
Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of sage-grouse leks and raptor nests.	<ol style="list-style-type: none"> 1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be gated. 2) Remote monitoring of well locations would be required where feasible. 	BMP's, Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA.
Chloride deicing agents are toxic to a variety of plants, fish, and other aquatic organisms and tend to increase the mobility of chemical elements in soil, such as heavy metals (Amrhein et al. 1992; National Research Council 1991).	<ol style="list-style-type: none"> 1) Use only non-chlorine deicing and dust control agents within the Upper Muddy Creek Watershed/Grizzly SMA. 	BLM Wyoming Sensitive Species List (USDI-BLM 2002b), BLM 6840 policy for special status species, Range-wide Conservation Agreement for Roundtail Chub, <i>Gila robusta</i> , Bluehead Sucker, <i>Catostomus discobolus</i> , and Flannelmouth Sucker, <i>Catostomus latipinnis</i> (UDNR 2004). Alternative, non-chloride deicing and dust control products are readily available.
The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration.	<ol style="list-style-type: none"> 1) No surface disturbances within aspen, juniper-woodland, true mountain mahogany, and serviceberry communities. 	Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a)
The combination of increased disturbance of big game resulting from development activities and existing fragmentation of movement corridors by fences would likely result in increased mortality.	<ol style="list-style-type: none"> 1) Convert fences to BLM standards or designs (e.g., rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees. 	BMP's, Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a). Improvement of big game movement through fences would help to mitigate the additional stresses of development within the ARPA.

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Sand Hills ACEC and Proposed JO Ranch Expansion SMA		
<p>There is currently an extensive road network within the SMA including those portions within the ARPA. Reducing the density of roads within the area and incorporating appropriate designs when improving existing roads would help to reduce disturbance of the unique vegetation community important to big game, greater sage-grouse, and Columbian sharp-tailed grouse.</p>	<ol style="list-style-type: none"> 1) Net reduction in road density within the SMA to a target of less than 3 miles/mile². 2) Transportation and well access roads would utilize existing road paths where feasible. 3) Where existing road paths do not provide sufficient lease access or are located within sensitive vegetation, highly erosive soils, or in proximity to sensitive wildlife resources, reclamation of existing roads (either inside or outside the ARPA) would provide for the construction of new road paths. 4) Improvement of existing roads or construction of new roads would be designed to minimize alteration of sensitive vegetation communities. 5) Detailed development, transportation, and reclamation plans, including road design, specific to those areas within the SMA will be required. 	<p>Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a). These roads are currently known to cause accelerated erosion of active dune complexes and associated disturbance of rare plant communities. Creation of new road paths would increase the potential for loss of rare vegetation communities through wind erosion of active dune complexes. The use of existing roads and appropriate designs for road improvement would allow for rapid revegetation and limit the disturbance of rare plant communities. Additionally, utilization of appropriate road designs would increase the effectiveness of the existing transportation network.</p>
<p>Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.</p>	<ol style="list-style-type: none"> 1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be seasonally closed. 2) Remote monitoring of well locations would be required where feasible. 	<p>Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA.</p>

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Sand Hills ACEC and Proposed JO Ranch Expansion SMA		
Chloride deicing agents are toxic to a variety of plants and tend to increase the mobility of chemical elements in soil, such as heavy metals (Amrhein et al. 1992; National Research Council 1991).	1) Use only non-chlorine deicing and dust control agents within the Sand Hills SMA.	To protect the silver sagebrush/bitterbrush community. Alternative, non-chloride deicing and dust control products are readily available.
The limited geographic extent of certain vegetation communities and their importance to a variety of wildlife species warrant special consideration.	1) Limit surface disturbances within the silver sagebrush/bitterbrush community of the Sand Hills to < 20 acres/mi ² .	Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a). The Sand Hills plant community is unique within the State of Wyoming. It also provides important seasonal and crucial winter habitats to a variety of wildlife species.
The combination of increased disturbance of big game resulting from development activities and existing fragmentation of movement corridors by fences would likely result in increased mortality.	1) Convert fences to BLM standards or designs (e.g., rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees.	Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a). Improvement of big game movement through fence crossings would help to mitigate the additional stresses of development within the ARPA.
Historic Trails SMA	See Historic Trails SMA for special protective measures.	Wyoming State Protocol—Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800
JO Ranch property (appendix M, map M-34, SMAs Overview).	1) No surface disturbance within the 18 acres surrounding JO Ranch Headquarters.	Wyoming State Protocol—Approved procedures for the implementation of Section 106 NHPA and 36 CFR 800

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Existing road network (appendix M, map M-34, Alternative C—SMAs Overview	<p style="text-align: center;">Red Rim / Daley SMA</p> <ol style="list-style-type: none"> 1) Road density within the SMA targeted for less than 3 miles/mile². 2) Where existing road paths do not provide sufficient lease access or are located within highly erosive soils or in proximity to sensitive wildlife resources, reclamation of existing roads (either inside or outside the ARPA) would provide for the construction of new road paths. 3) Improvement of existing roads or construction of new roads would be designed to minimize hydrologic alteration. Specific road design criteria would be based on site-specific review and likely include a combination of mitigation options. 	Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a). These roads are currently known to cause accelerated erosion and hydrologic alteration. Upgrading these roads to improved or low-impact design specifications would decrease these impacts while allowing vehicular access to lease holdings. Additionally, utilization of appropriate road designs would increase the effectiveness of the existing transportation network.
Human presence	<ol style="list-style-type: none"> 1) Existing levels of public access would be maintained. In most cases, this would require new and improved roads be gated. 	Minimum programmatic standards recommended by the Wyoming Game and Fish Department to sustain wildlife habitats affected by oil and gas development (WGFD 2004). There is currently no public access to the majority of the SMA. Maintaining a limited human presence within this area would help to maintain a movement corridor for big game and limit disturbance of leks and raptor nests.

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

Data Source Resource Concern	Protection Measure	Justification Assumptions for Analysis/Comments
Red Rim / Daley SMA		
Wildlife movements	1) Convert fences to BLM standards or designs (e.g., rail top fence) to facilitate big game movement throughout the SMA, and in coordination with grazing permittees.	Standards and Guidelines assessment for Upper Colorado River Basin (USDI-BLM 2002a). Improving big game movement through or across fences would help to mitigate the additional stresses of development within the ARPA.
Habitat fragmentation due to power-line and pipeline corridors	1) Avoidance of power-line and pipeline corridor development south of the existing power-line that crosses the Red Rim / Daley Area (SMA).	Designated Corridor EIS (USDI-BLM Draft in progress)

Notes:

- ARPA – Atlantic Rim Project Area
- BLM – Bureau of Land Management
- BMP – Best Management Practice
- CFR – Code of Federal Regulations
- DEM – digital elevation model
- EIS – environmental impact statement
- EO – Executive Order
- NHPA – National Historic Preservation Act
- PFC – Proper Function Condition
- ROW – right-of-way
- SHPO – State Historic Preservation Office
- SMA – Special Management Area
- VRM – Visual Resource Management

APPENDIX L. RESOURCE CONCERNS AND ASSOCIATED PROTECTION MEASURES PROPOSED UNDER ALTERNATIVE C

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Appendix M

Maps

APPENDIX M

MAPS

This appendix contains maps referenced throughout the document and serves as a visual reference. The Bureau of Land Management shall not be held liable for improper or incorrect use of this data, based on the description of appropriate/inappropriate use described in this document. The distributor makes no claim for the data's suitability for other purposes.

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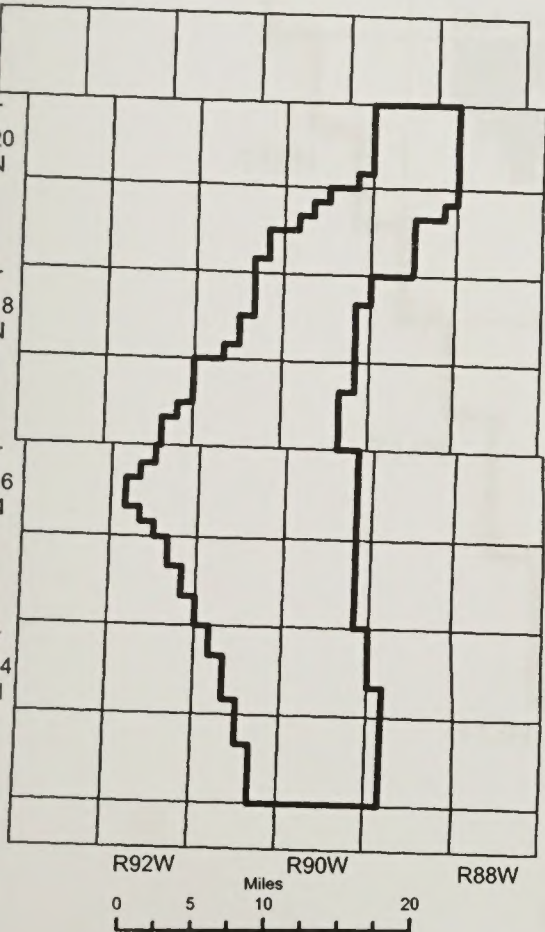
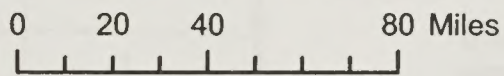
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APPENDIX M. MAPS

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ATLANTIC RIM FINAL EIS MAP

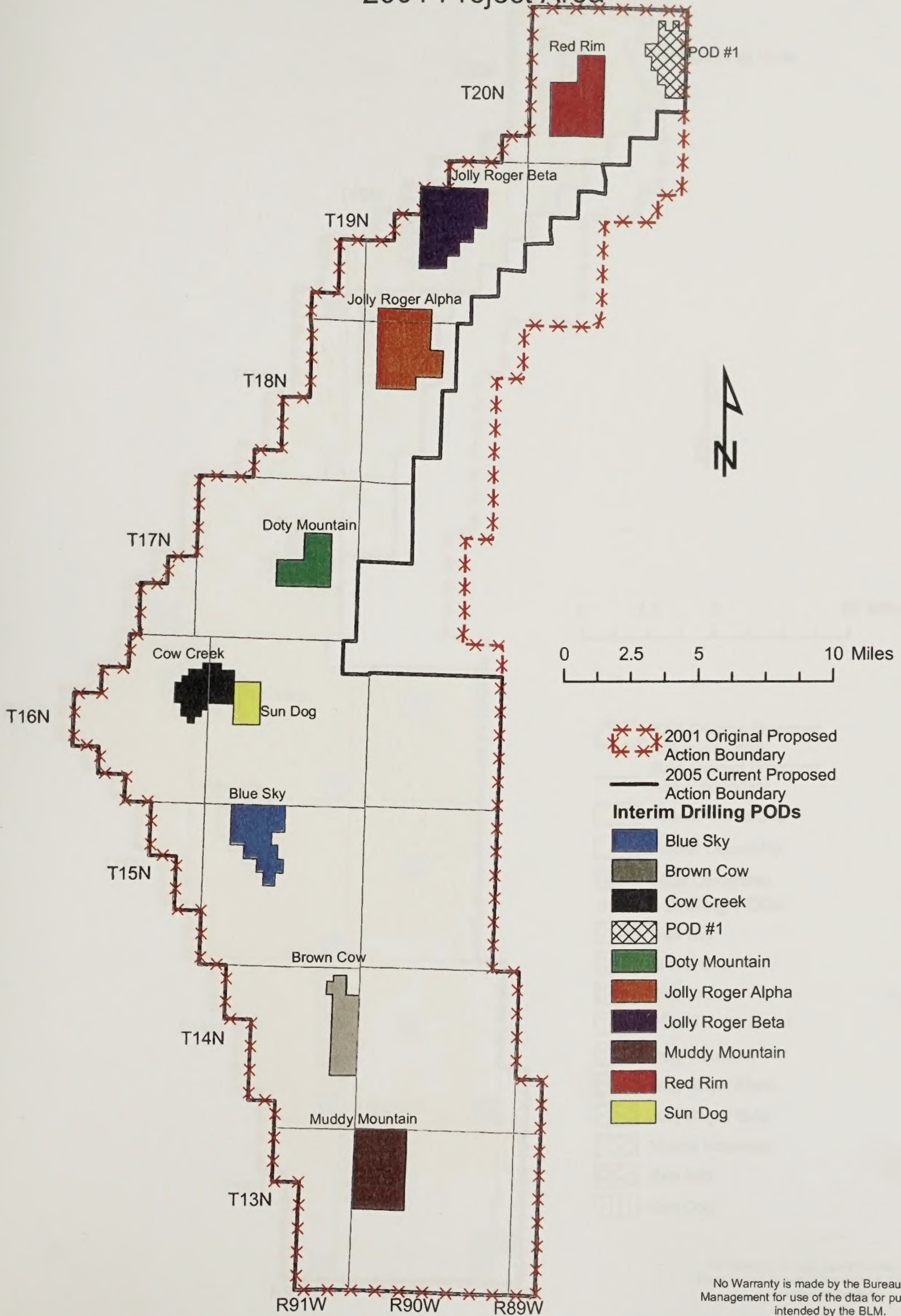
Project Area Map



- Cities
- +— Interstate Highways
- Highways
- Counties
- ▭ Atlantic Rim Project Area

No Warranty is made by the Bureau of Land Management for use of data for purposes not intended by the BLM.

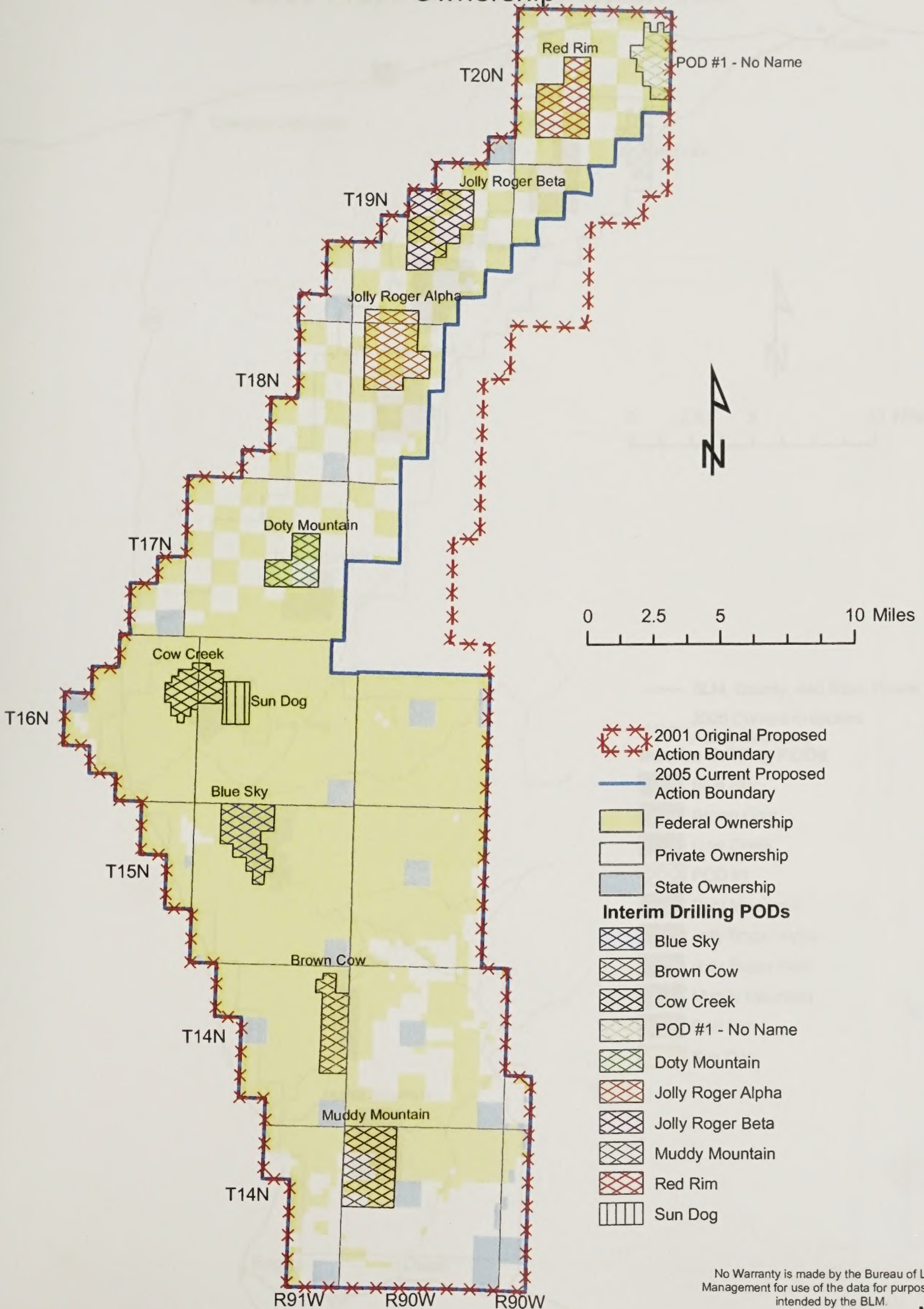
ATLANTIC RIM FINAL EIS MAP 2001 Project Area



No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

ATLANTIC RIM FINAL EIS MAP

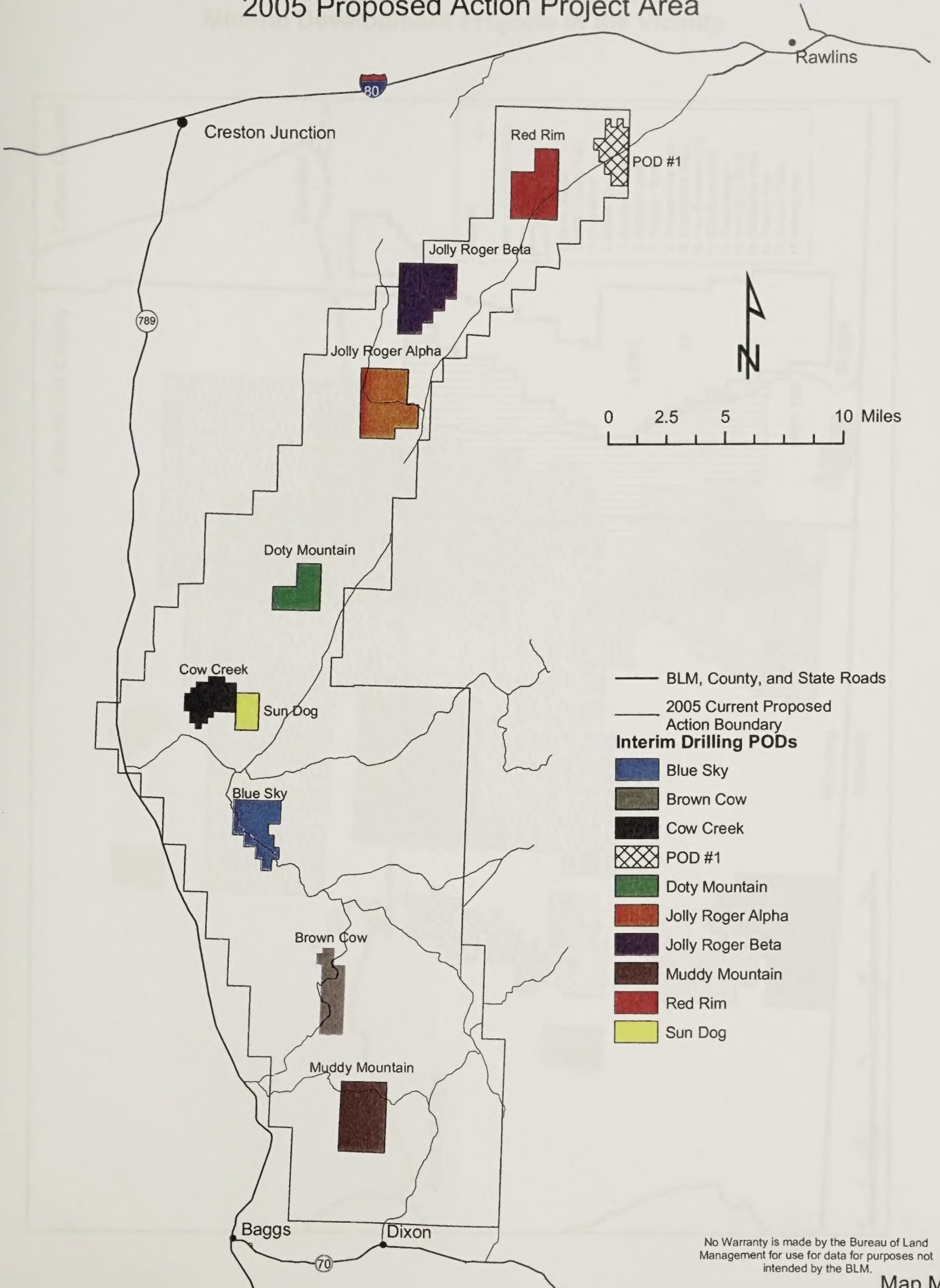
Ownership



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ATLANTIC RIM FINAL EIS MAP

2005 Proposed Action Project Area

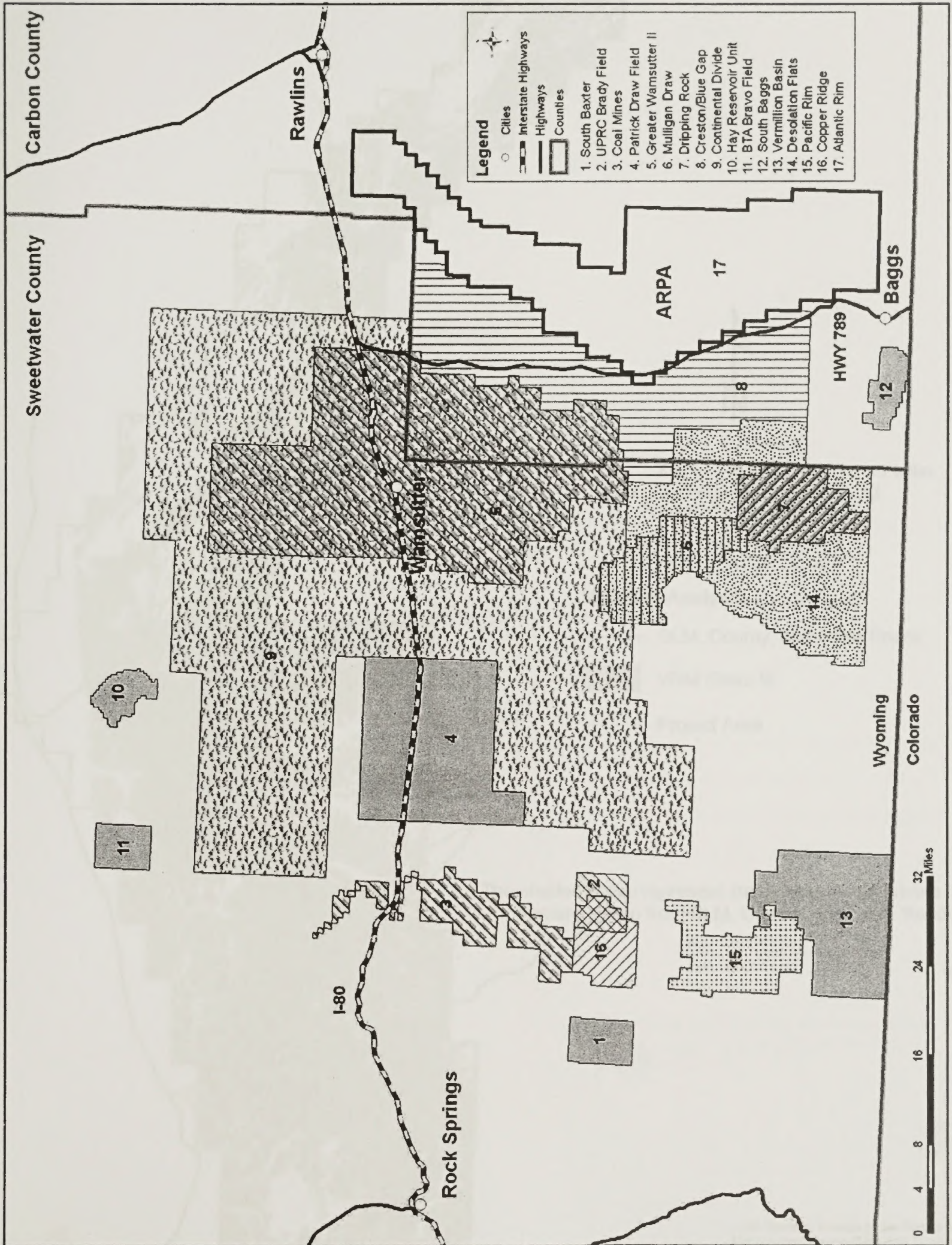


- BLM, County, and State Roads
- 2005 Current Proposed Action Boundary
- Interim Drilling PODs**
- Blue Sky
- Brown Cow
- Cow Creek
- POD #1
- Doty Mountain
- Jolly Roger Alpha
- Jolly Roger Beta
- Muddy Mountain
- Red Rim
- Sun Dog

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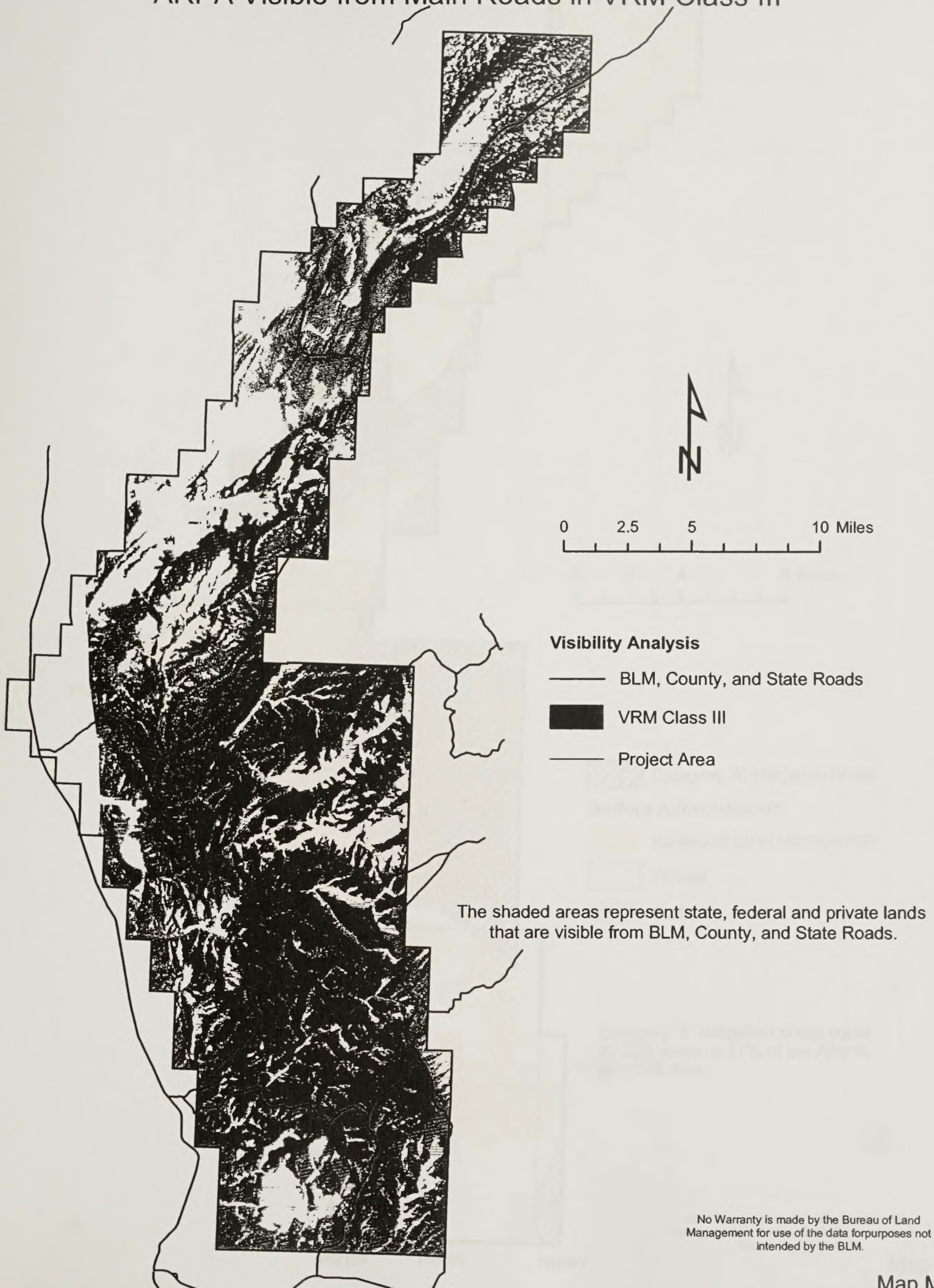
ATLANTIC RIM FINAL EIS MAP

Mineral Development Projects in the Vicinity



ATLANTIC RIM FINAL EIS MAP

ARPA Visible from Main Roads in VRM Class III



Visibility Analysis

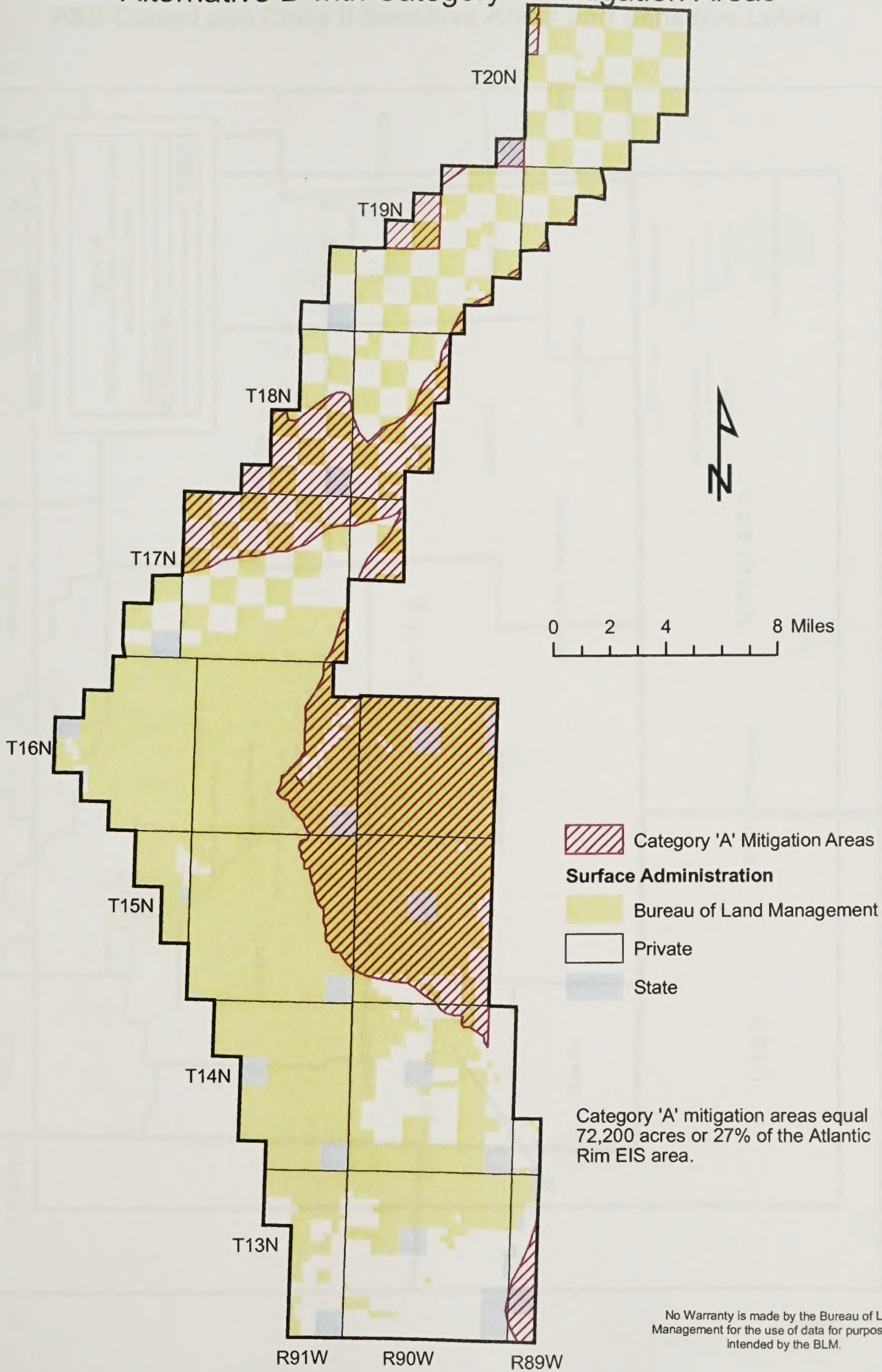
- BLM, County, and State Roads
- VRM Class III
- Project Area

The shaded areas represent state, federal and private lands that are visible from BLM, County, and State Roads.

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ATLANTIC RIM FINAL EIS MAP

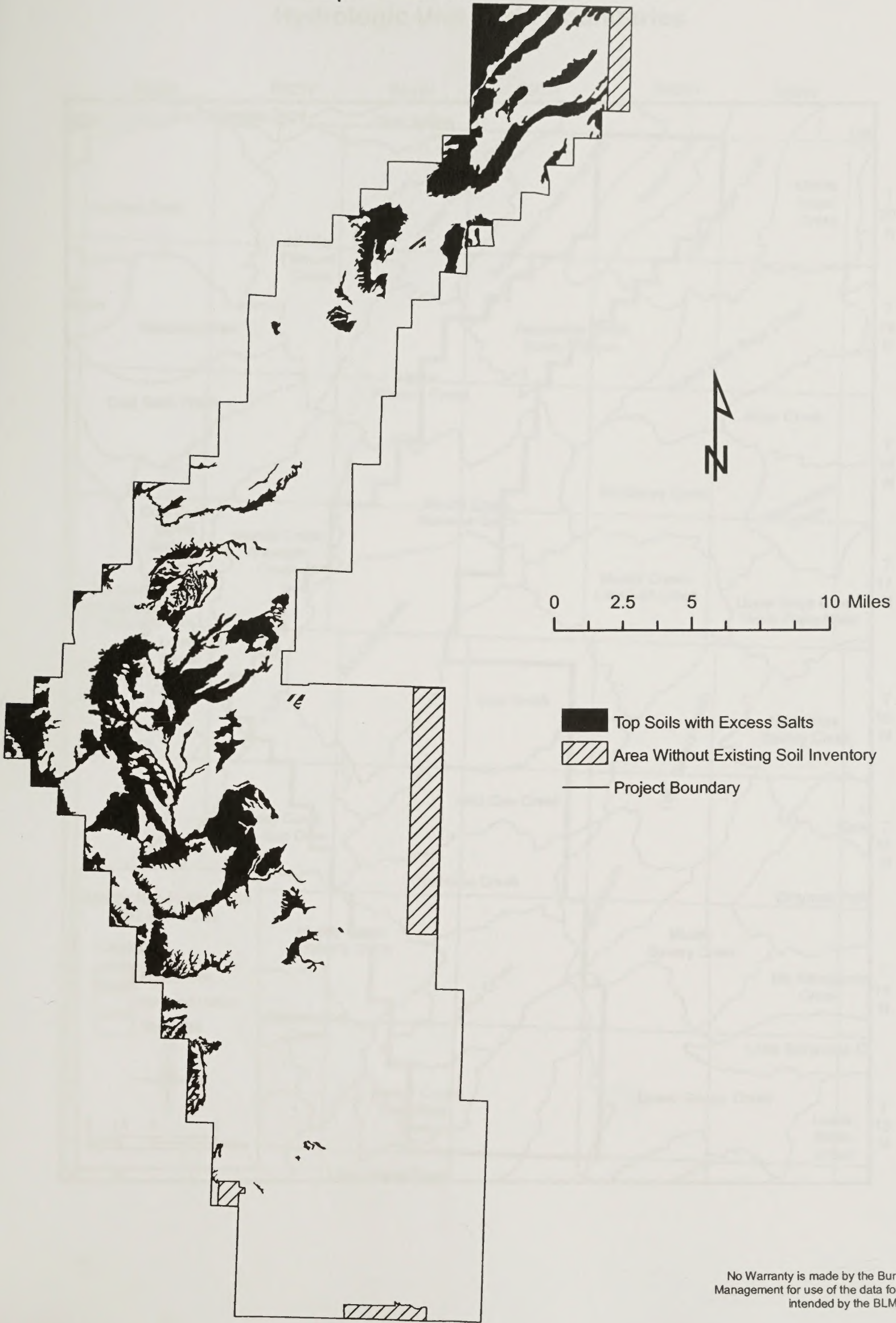
Alternative D with Category A Mitigation Areas



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ATLANTIC RIM FINAL EIS MAP

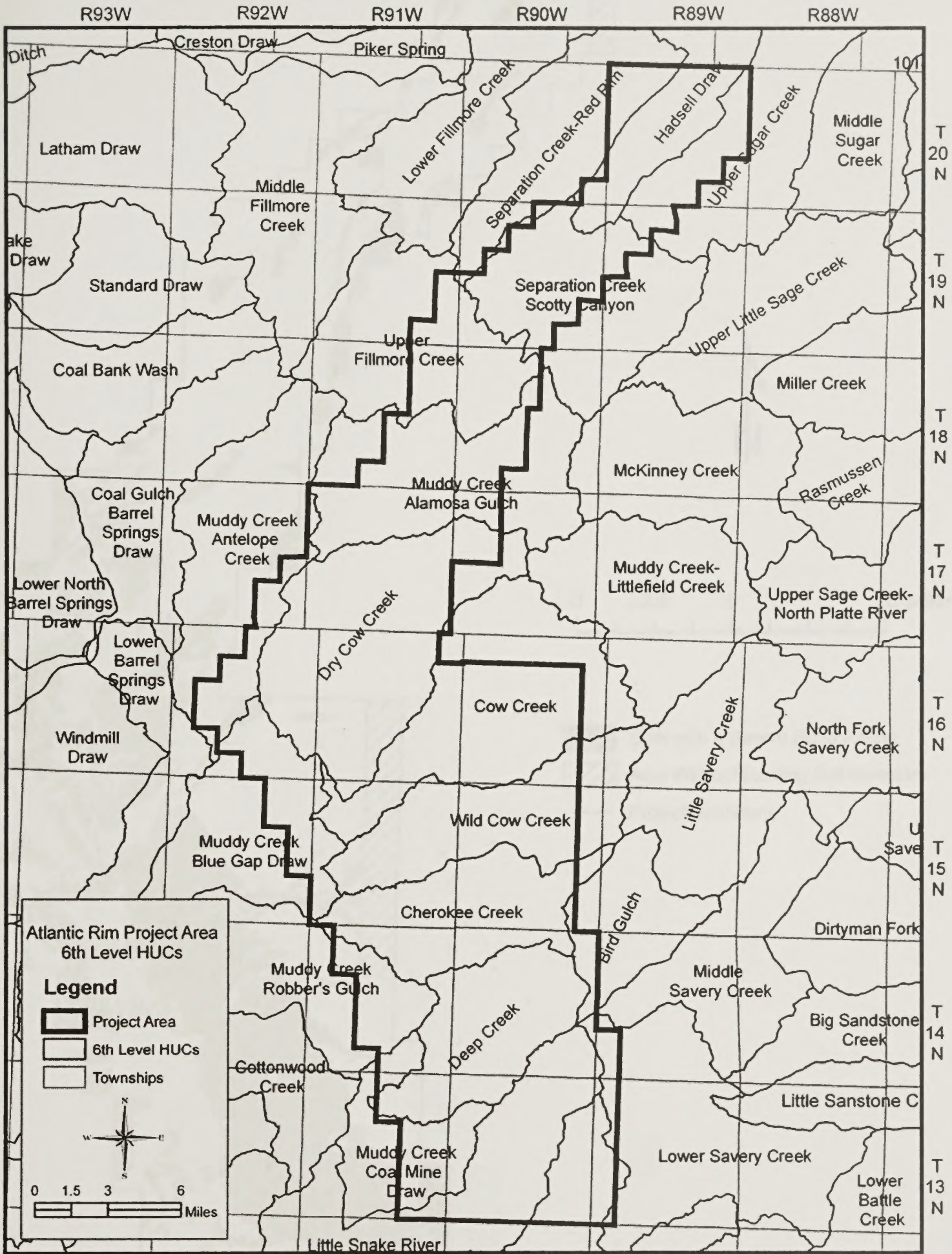
Top Soils with Excess Salts



No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

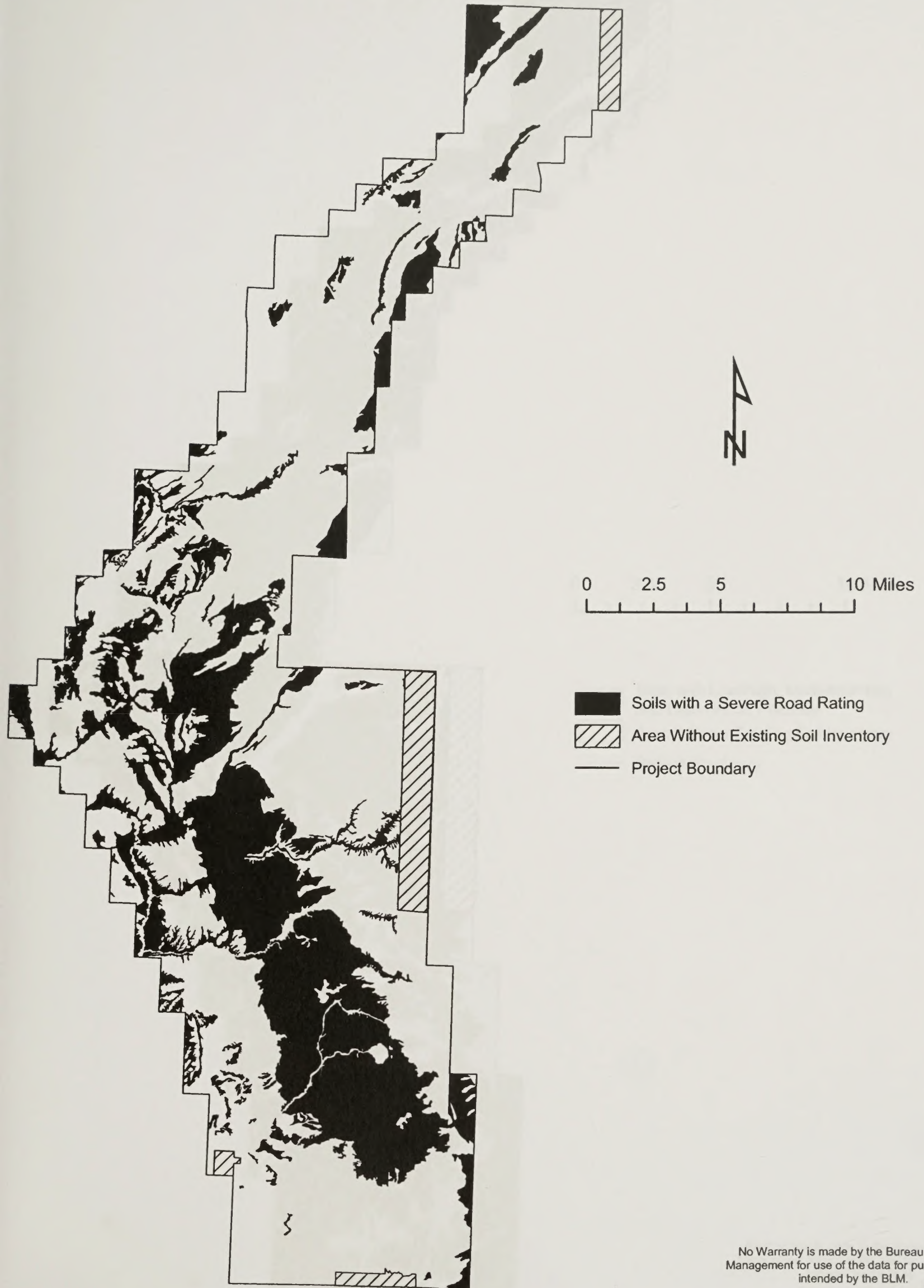
ATLANTIC RIM FINAL EIS MAP

Hydrologic Unit Code Boundaries



ATLANTIC RIM FINAL EIS MAP

Soils with a Severe Road Rating



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ATLANTIC RIM FINAL EIS MAP

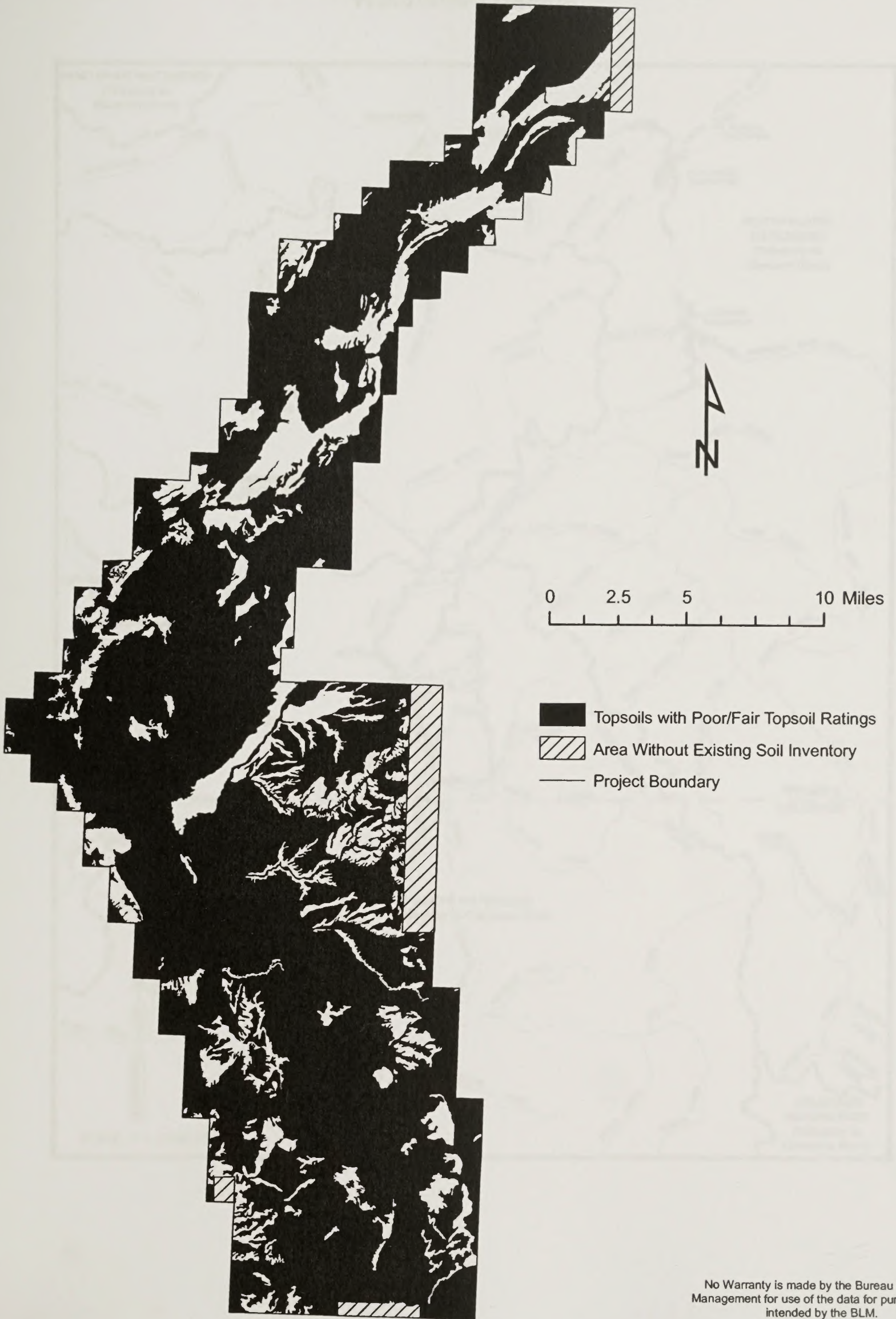
Soils with Elevated Runoff Potential



No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

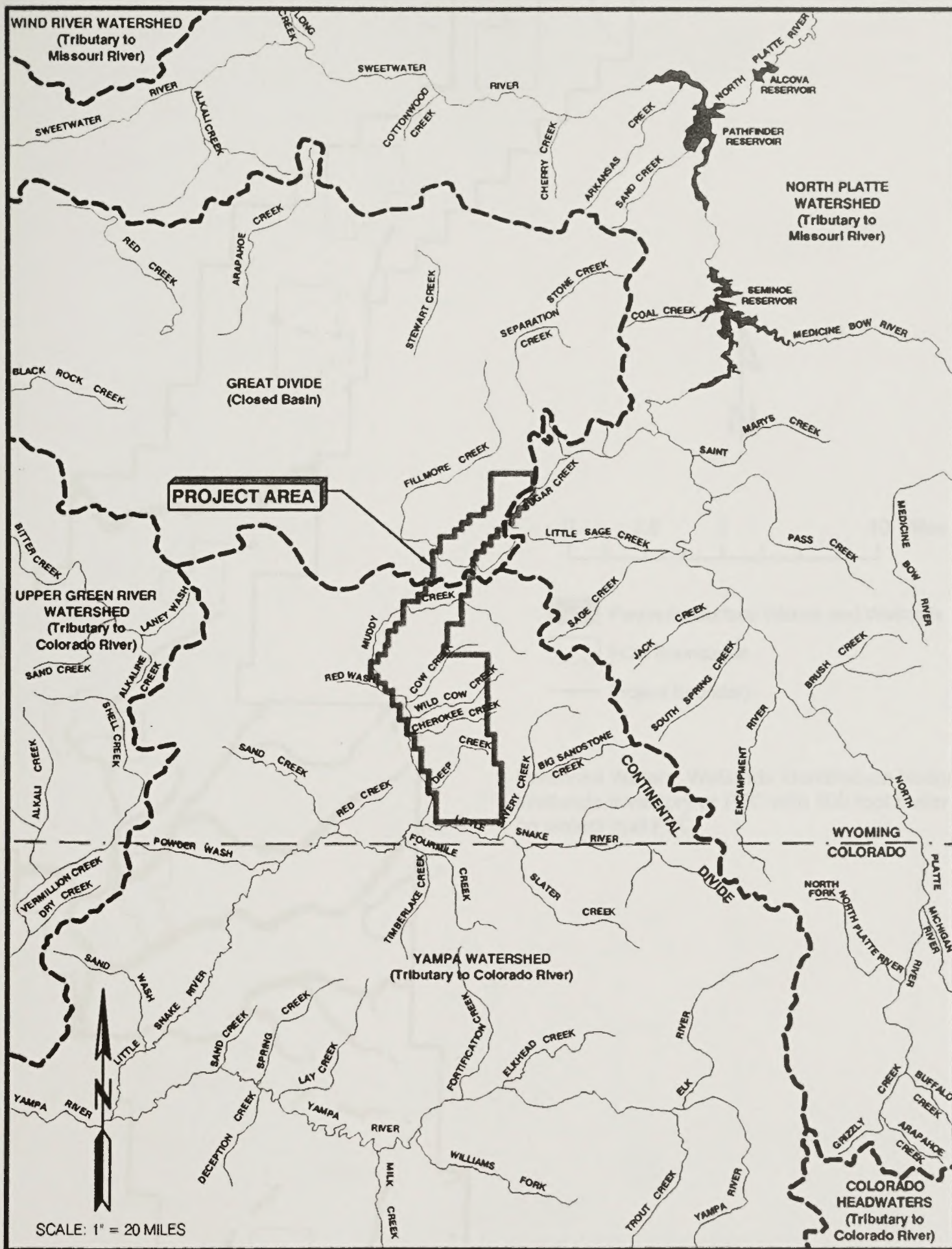
ATLANTIC RIM FINAL EIS MAP

Soils with Poor/Fair Topsoil Ratings



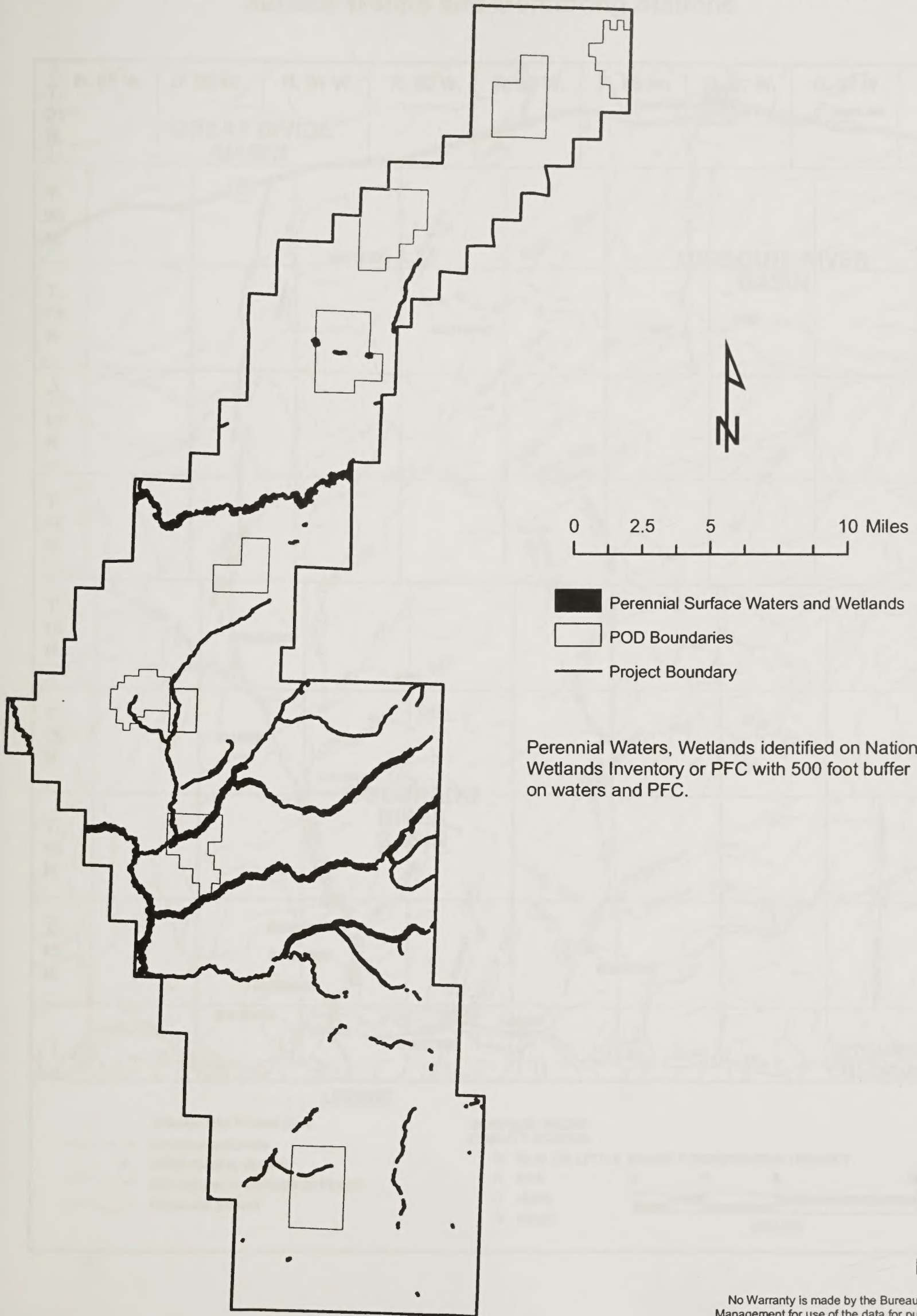
ATLANTIC RIM FINAL EIS MAP

Watershed Basins



ATLANTIC RIM FINAL EIS MAP

Alternative C - Perennial Surface Waters and Wetlands

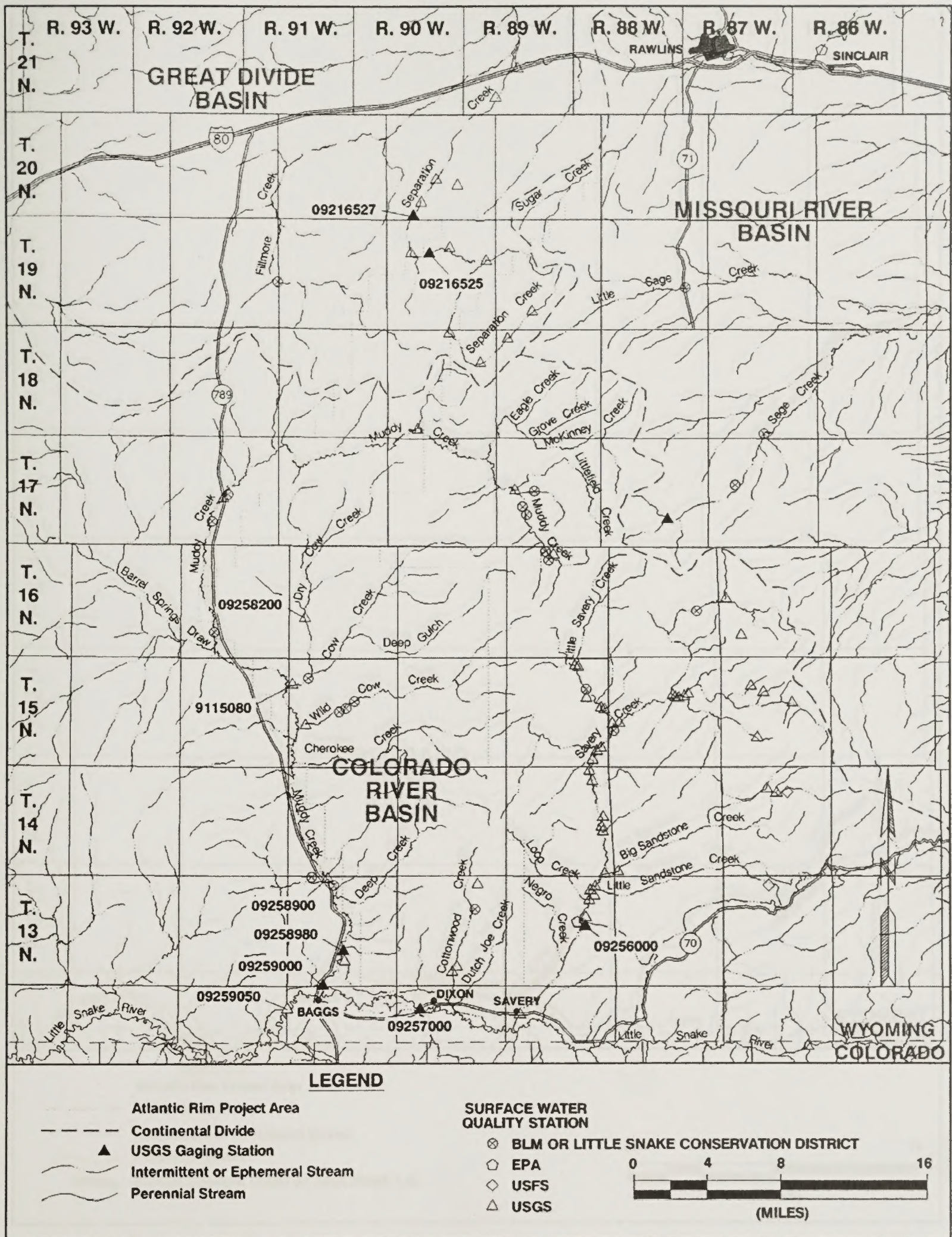


Map M-15

No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

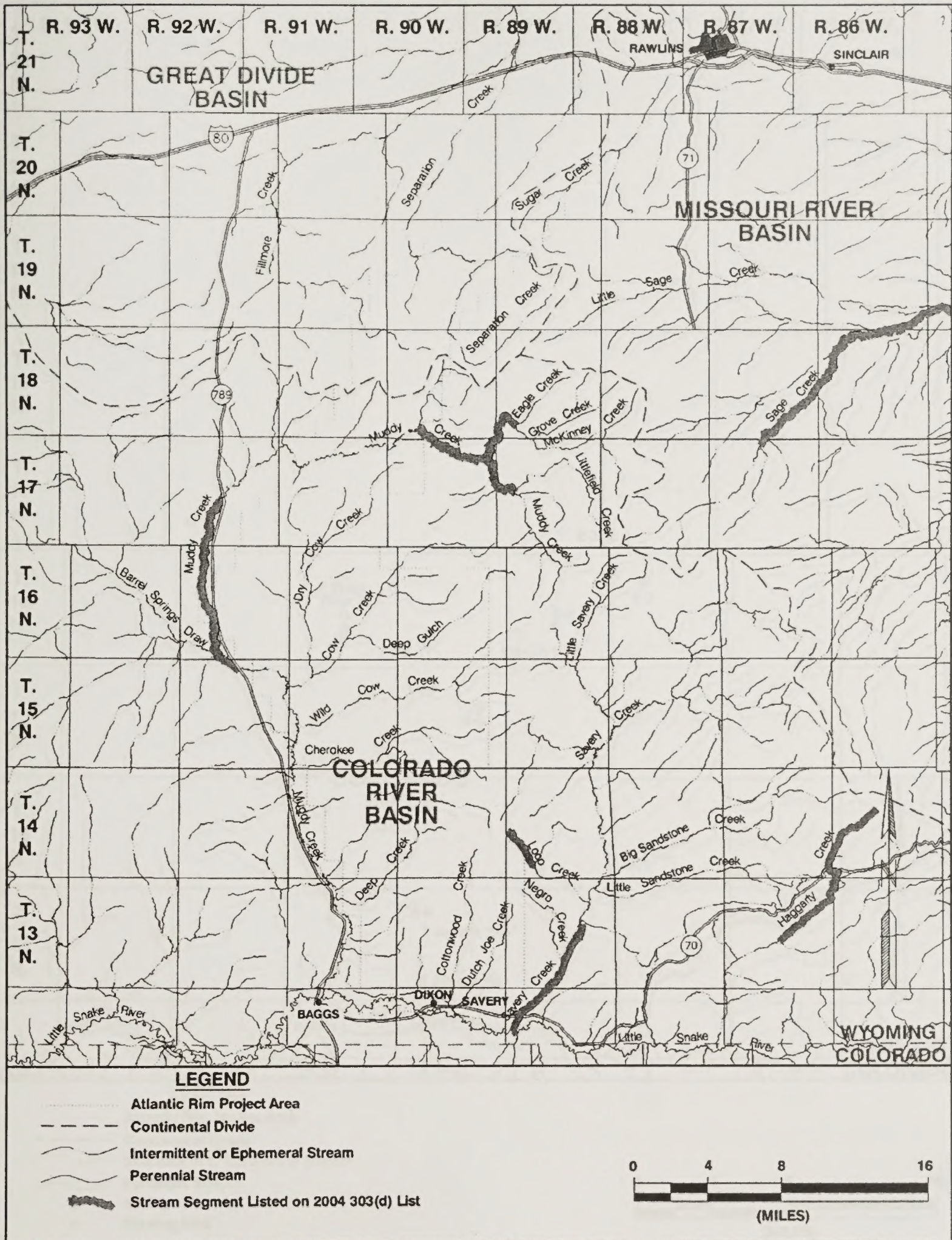
ATLANTIC RIM FINAL EIS MAP

Surface Waters and Monitoring Stations



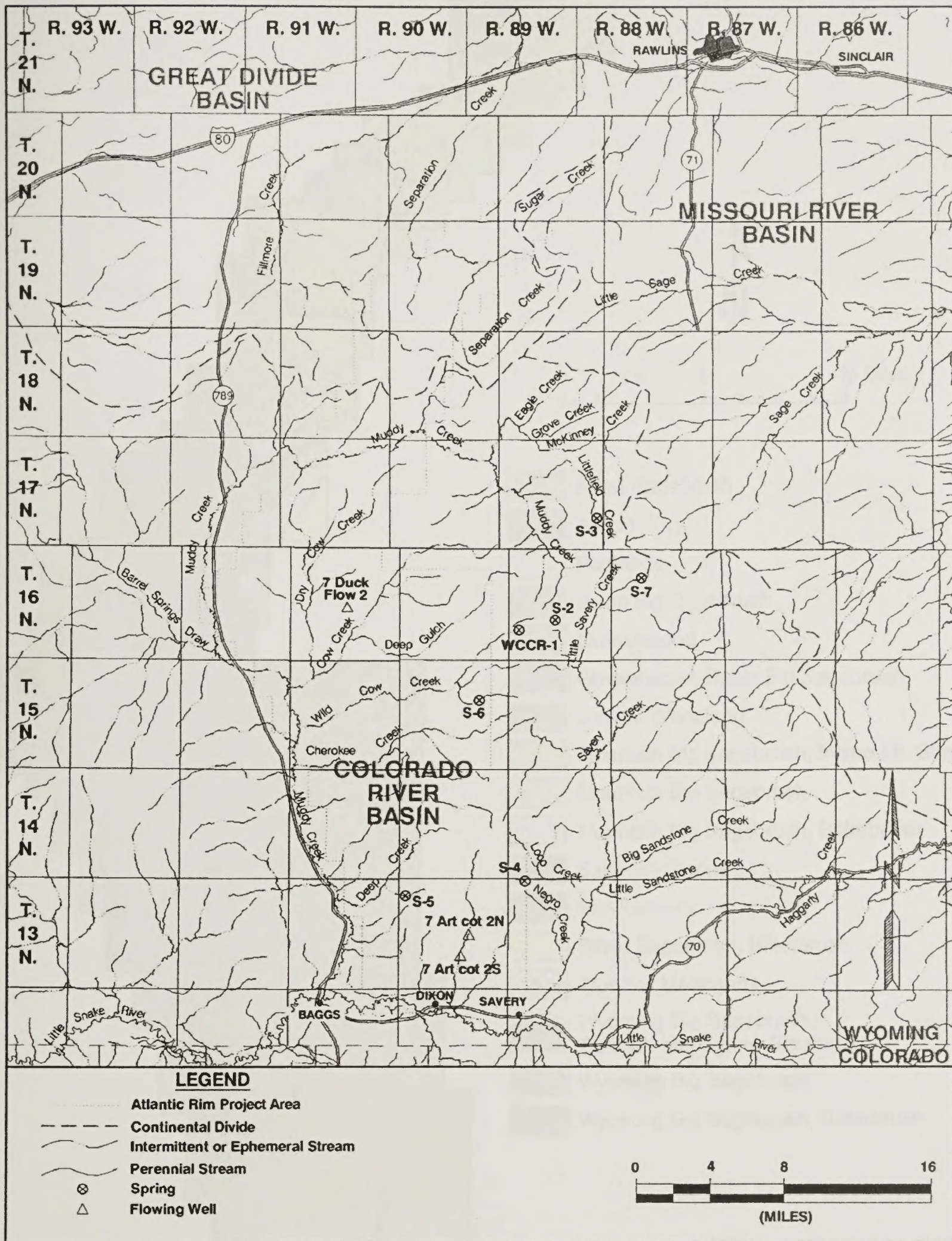
ATLANTIC RIM FINAL EIS MAP

Threatened or Impaired Streams



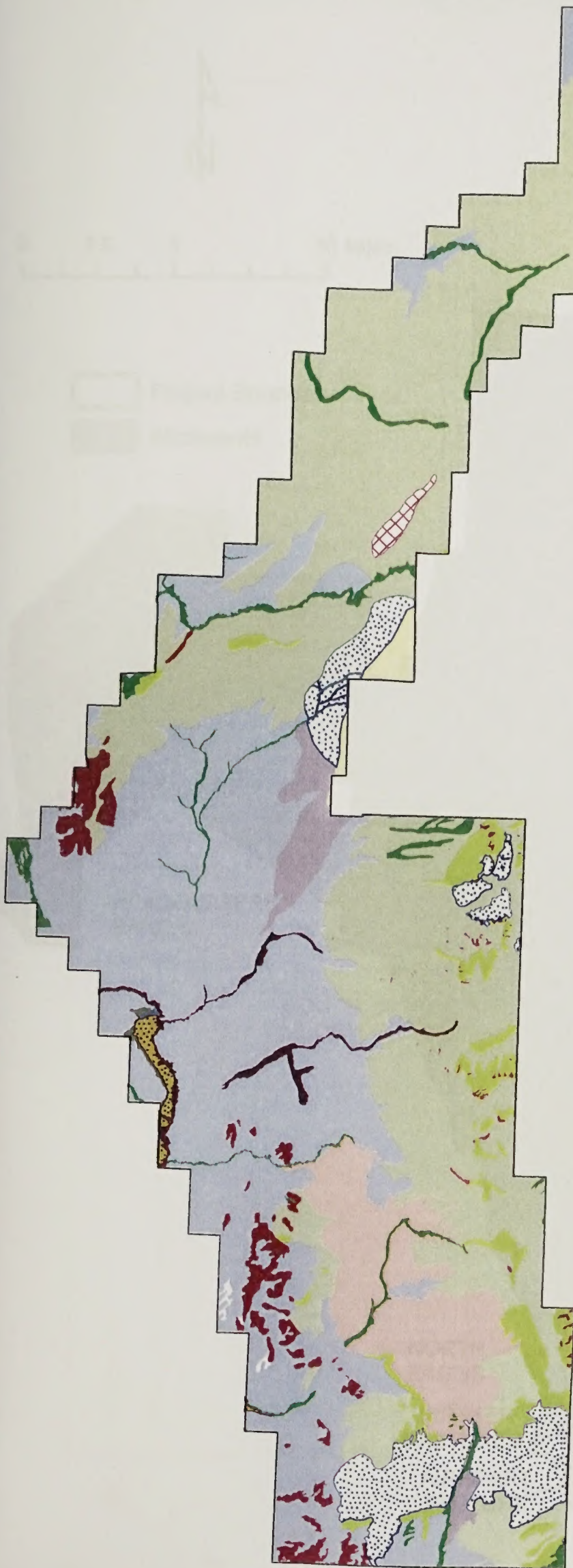
ATLANTIC RIM FINAL EIS MAP

Sampled Springs and Flowing Wells



ATLANTIC RIM FINAL EIS MAP

Vegetation Communities



0 2.5 5 10 Miles

-  Alkali Sagebrush
-  Aspen
-  Badlands
-  Basin Big Sagebrush
-  Greasewood
-  Greasewood, Basin Big Sagebrush
-  Juniper Woodland
-  Mountain Big Sagebrush, Mixed Mt. Shrub
-  Mountain Big Sagebrush
-  Mountain Big Sagebrush, Bitterbrush
-  Saltbush Steppe
-  Serviceberry
-  Silver Sagebrush, Bitterbrush
-  True Mt. Mahogany
-  Wyoming Big Sagebrush, True Mt. Mahogany, Bitterbrush
-  Wyoming Big Sagebrush
-  Wyoming Big Sagebrush, Bitterbrush



No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

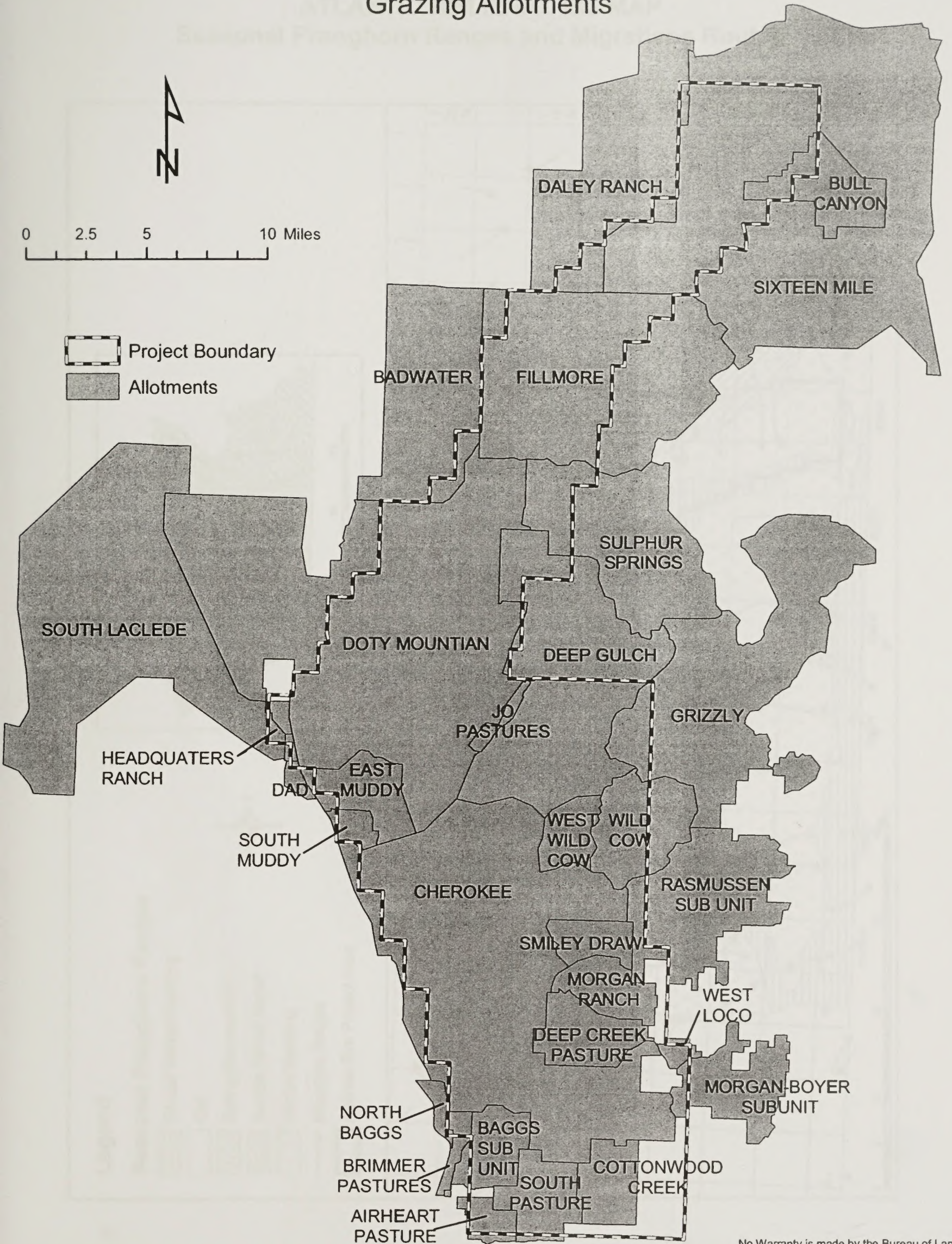
ATLANTIC RIM FINAL EIS MAP

Grazing Allotments



0 2.5 5 10 Miles

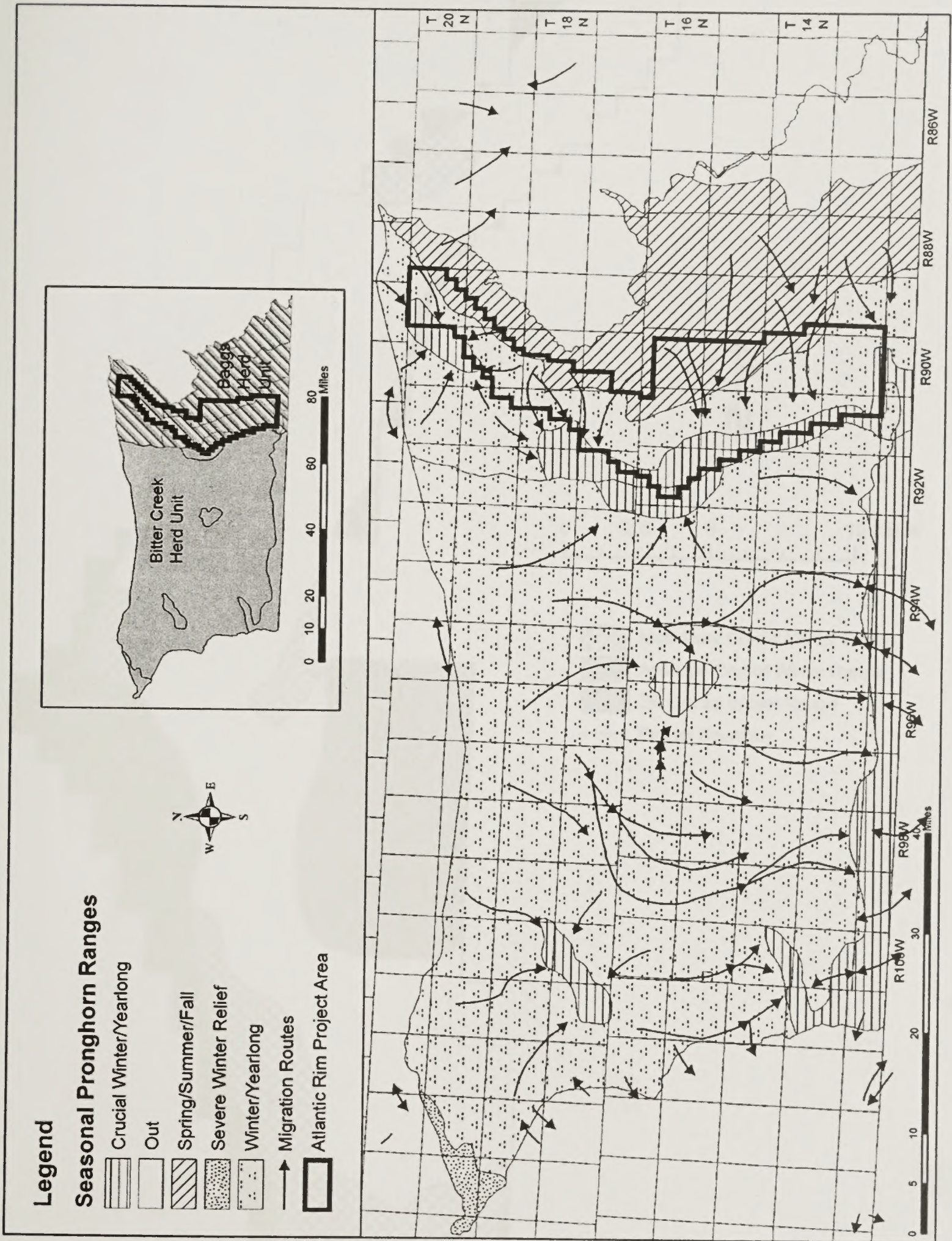
-  Project Boundary
-  Allotments



No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

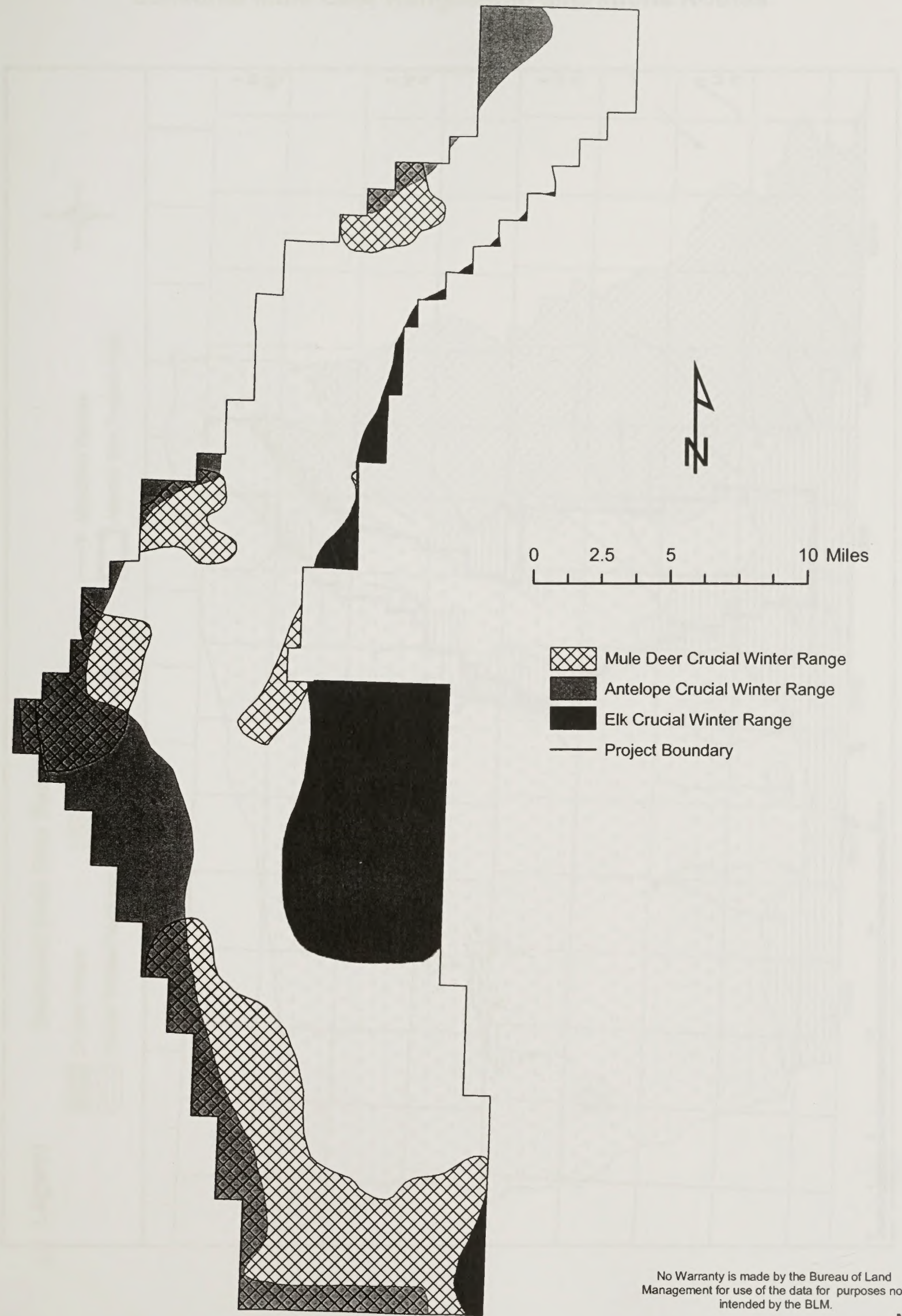
ATLANTIC RIM FINAL EIS MAP

Seasonal Pronghorn Ranges and Migrations Routes



ATLANTIC RIM FINAL EIS MAP

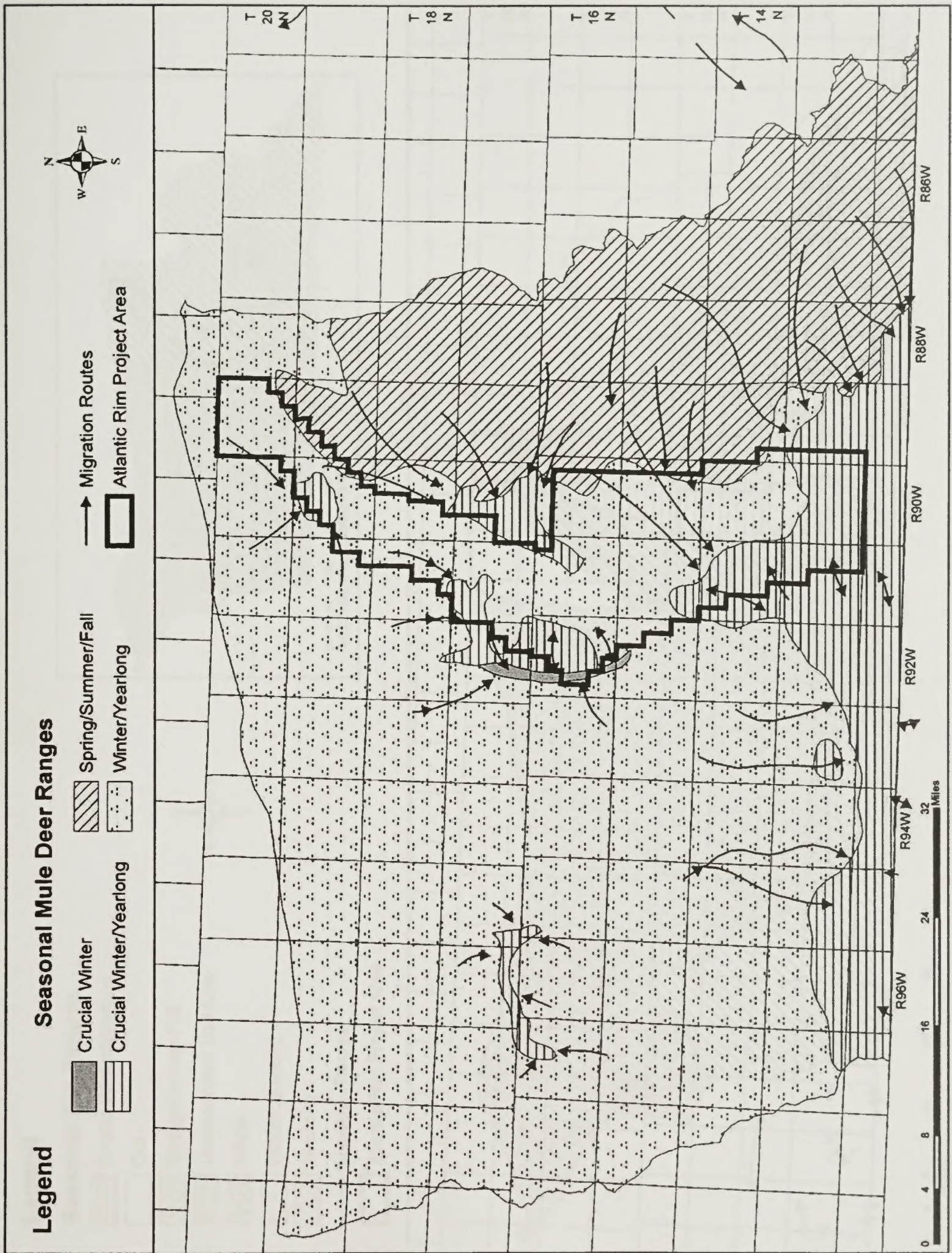
Big Game Crucial Winter Ranges



No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

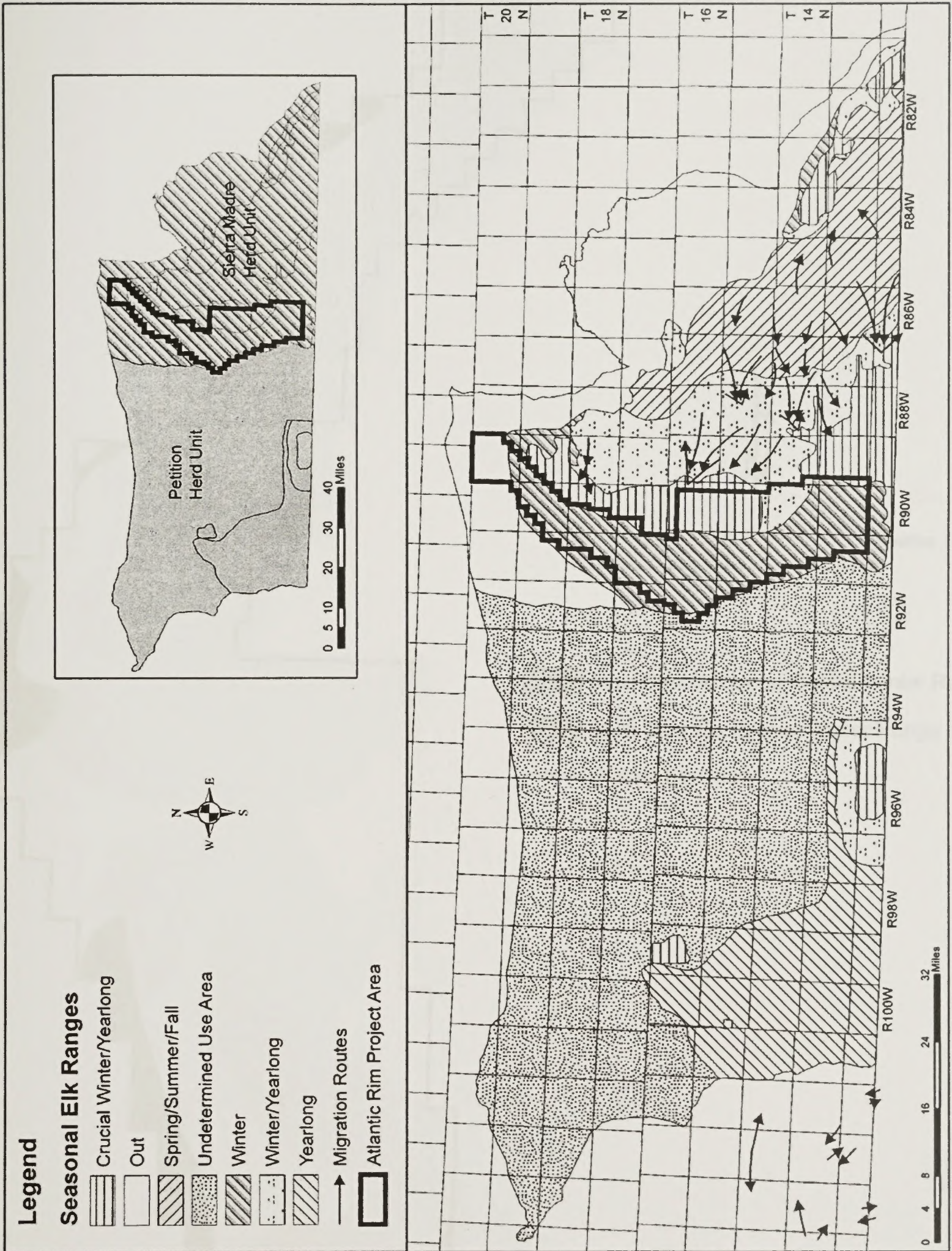
ATLANTIC RIM FINAL EIS MAP

Seasonal Mule Deer Ranges and Migrations Routes



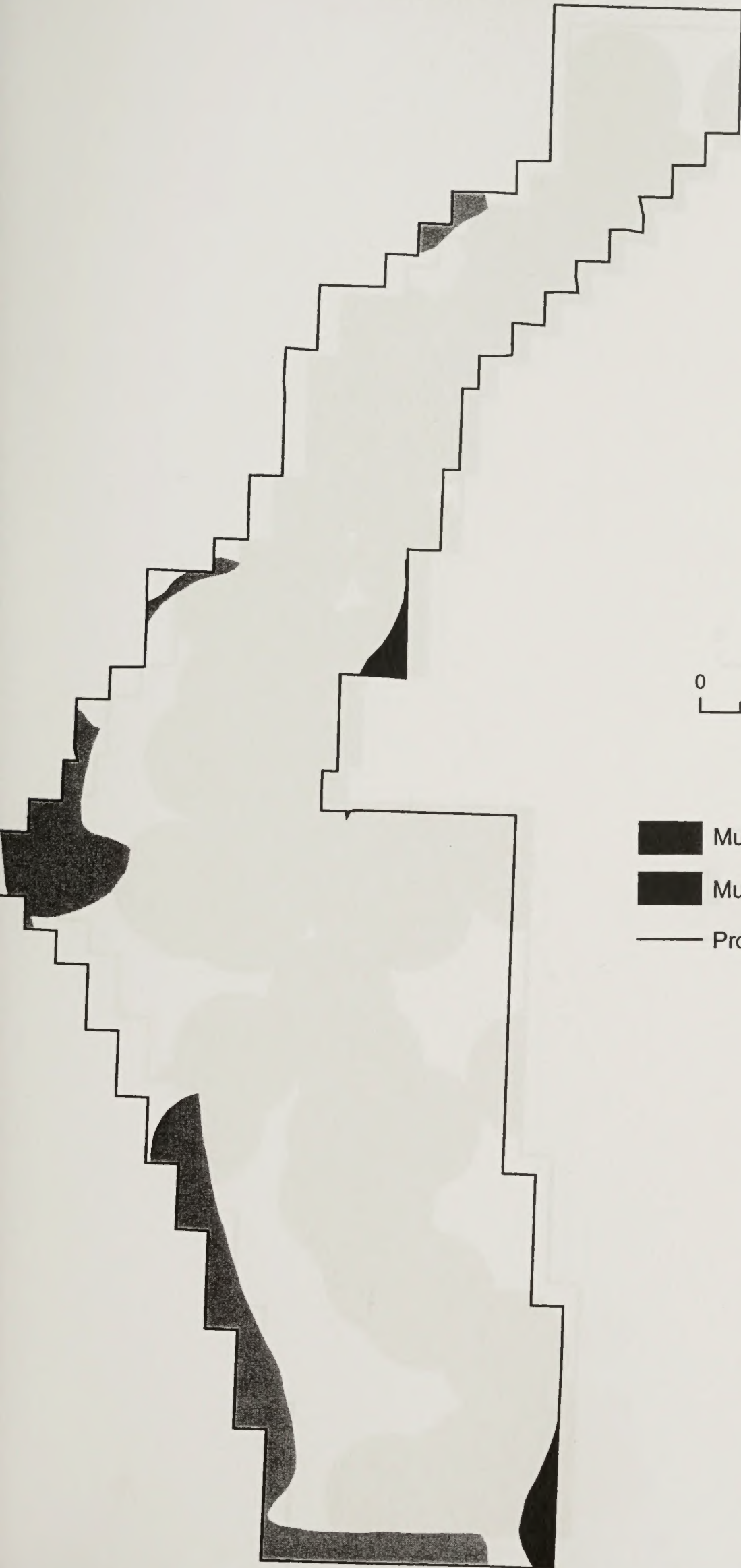
ATLANTIC RIM FINAL EIS MAP

Seasonal Elk Ranges and Migrations Routes


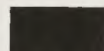



ATLANTIC RIM FINAL EIS MAP

Overlapping Crucial Winter Ranges

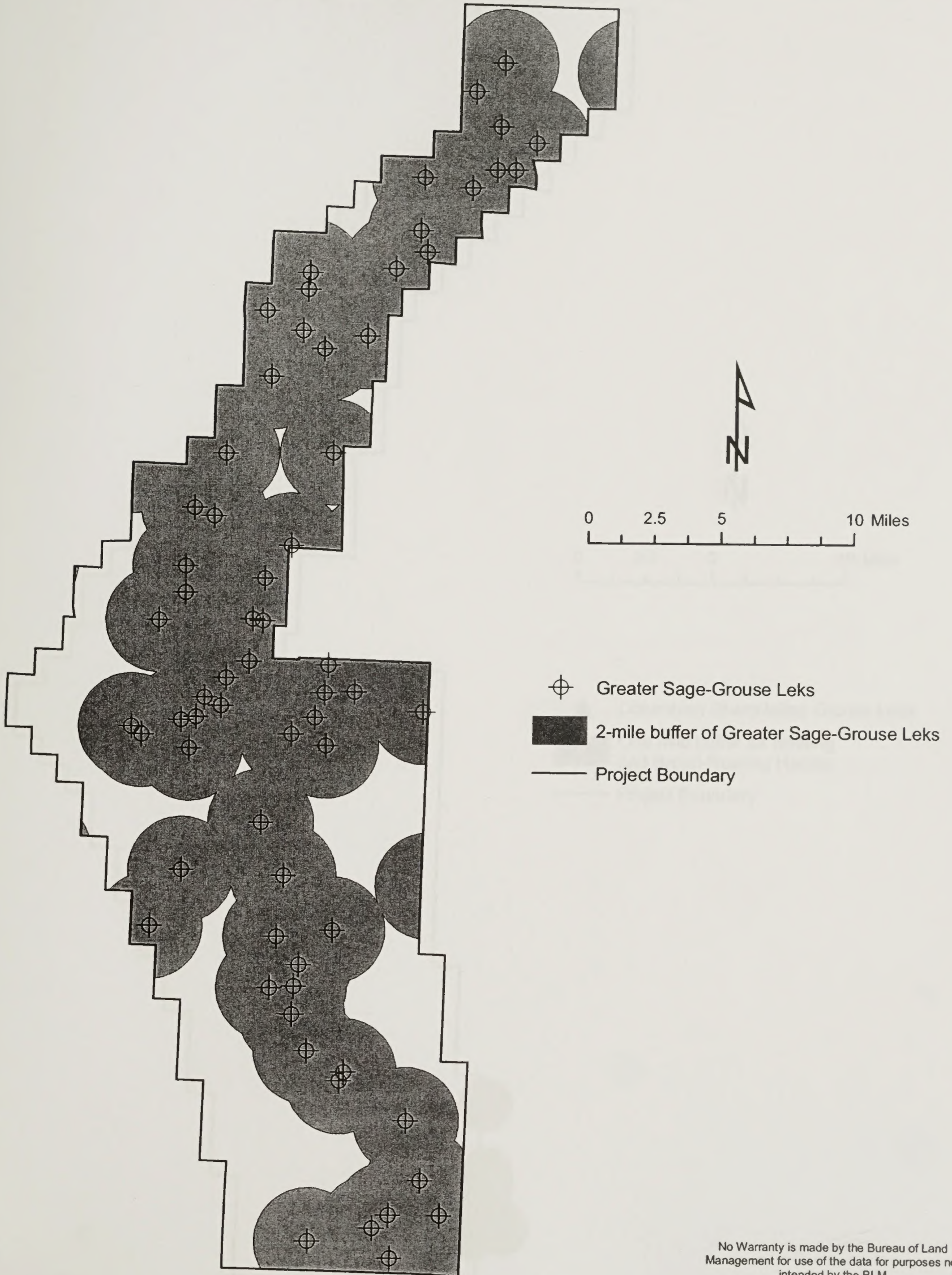


0 2.5 5 10 Miles

-  Mule Deer/Antelope Crucial Winter Range
-  Mule Deer/Elk Crucial Winter Range
-  Project Boundary

ATLANTIC RIM FINAL EIS MAP

Greater Sage-Grouse Leks

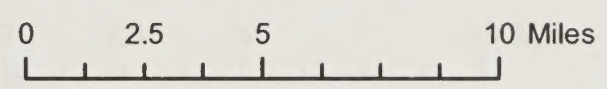





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ATLANTIC RIM FINAL EIS MAP

Columbian Sharp-tailed Grouse Leks

Nesting and Brood-Rearing Habitat

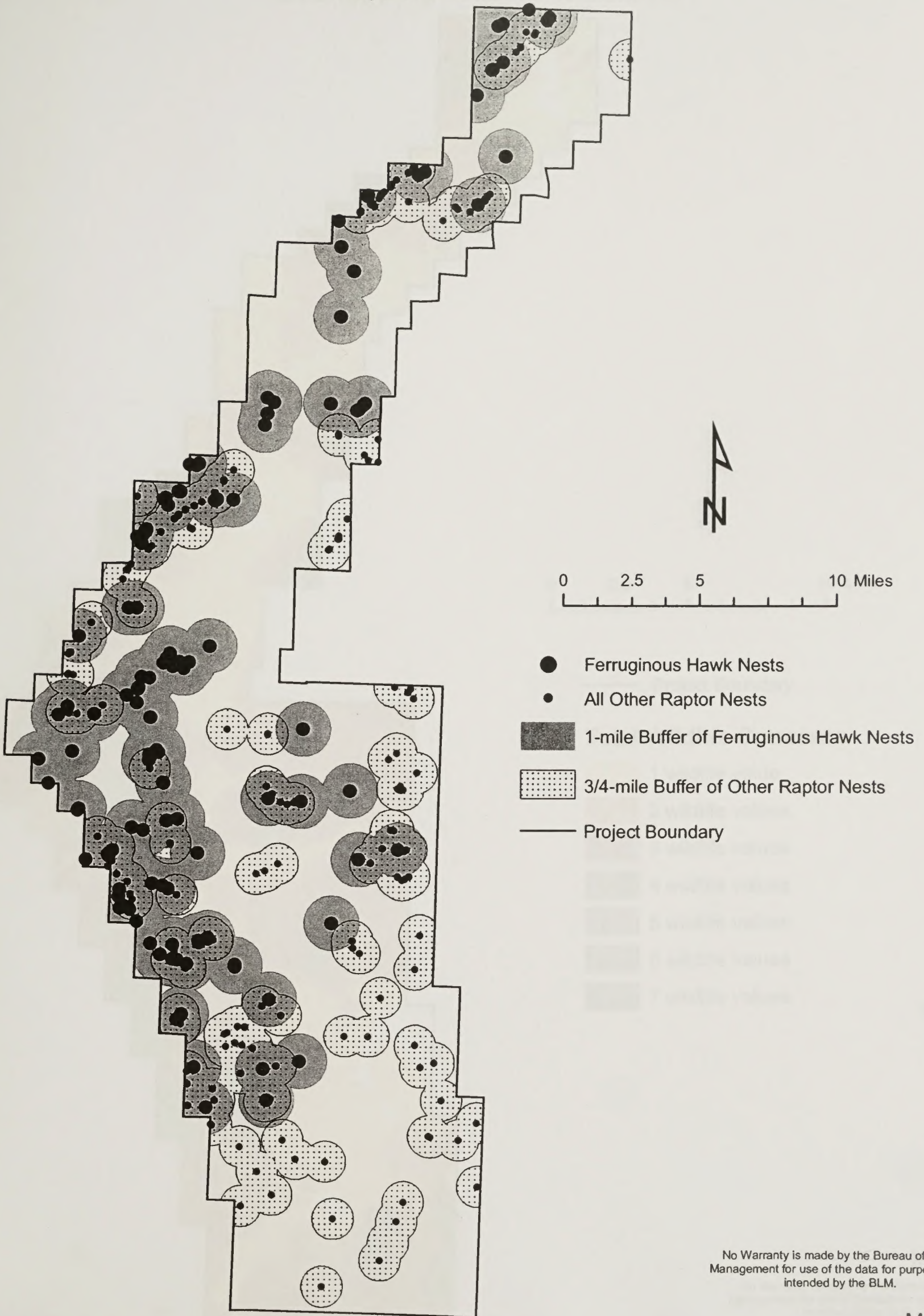


-  Columbian Sharp-tailed Grouse Leks
-  One mile buffer for Nesting and Brood-Rearing Habitat
-  Project Boundary

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ATLANTIC RIM FINAL EIS MAP

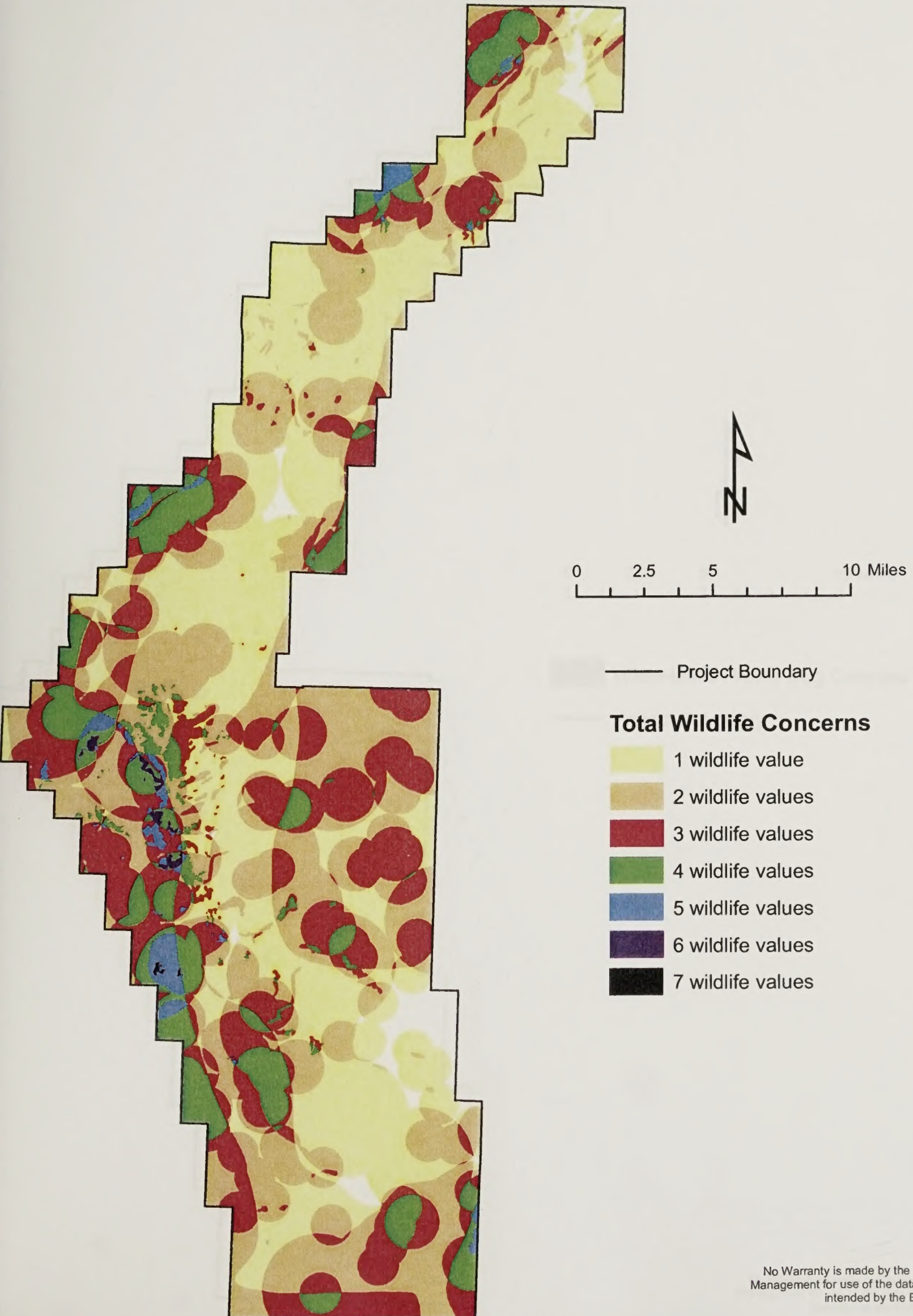
Raptor Nest Locations



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ATLANTIC RIM FINAL EIS MAP

Overlapping Wildlife Concerns

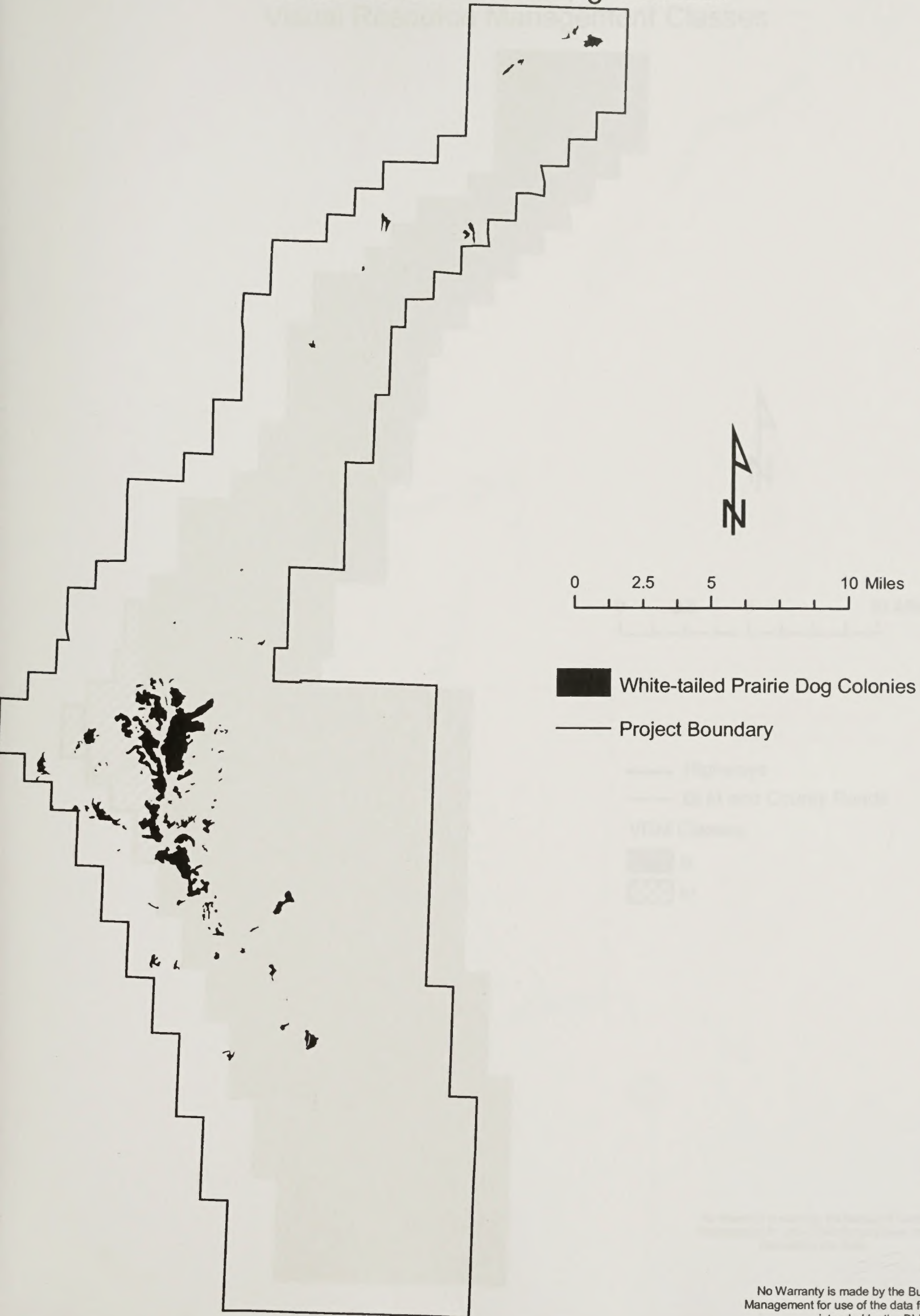


Map M-29

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ATLANTIC RIM FINAL EIS MAP

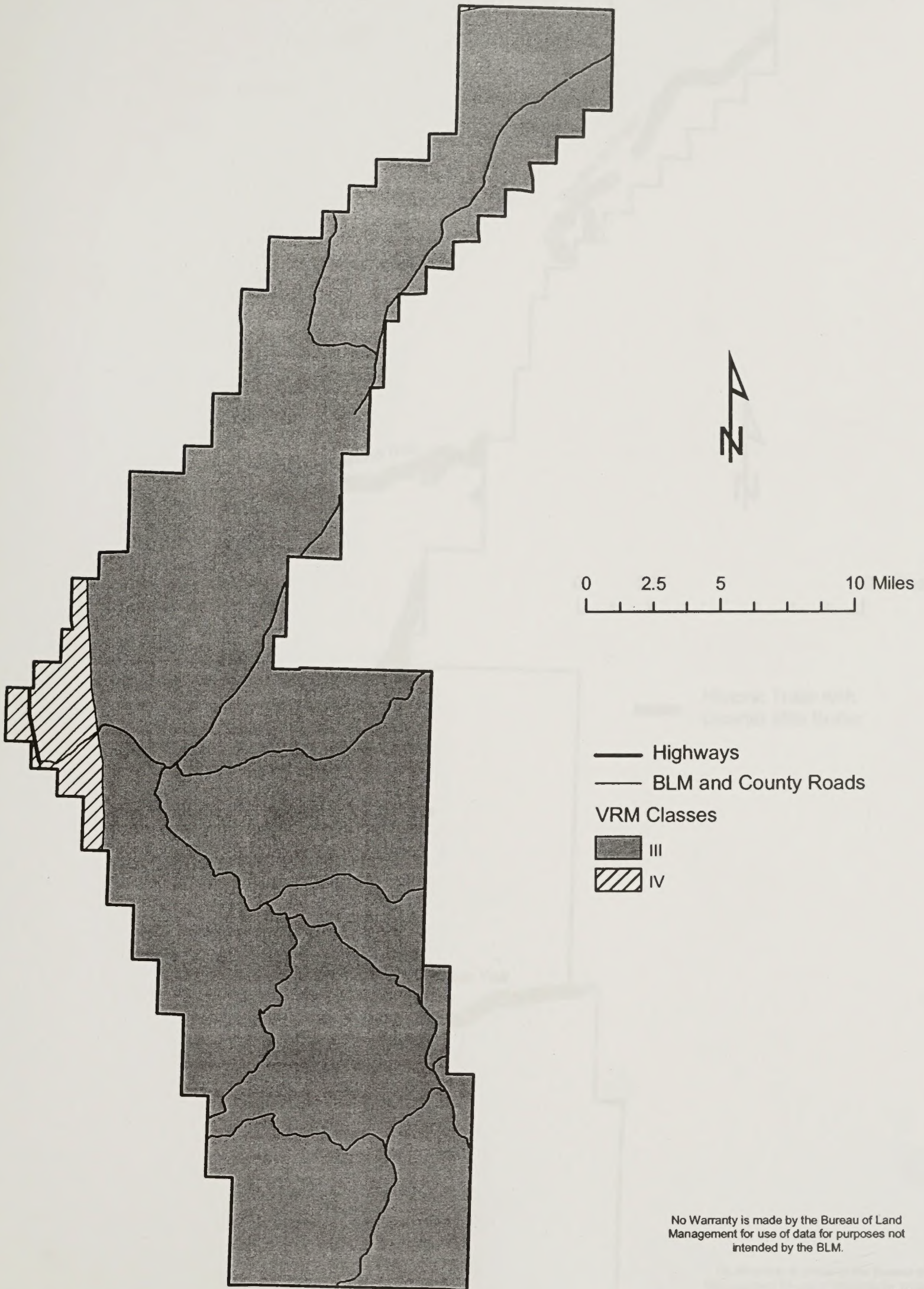
White-Tailed Prairie Dog Colonies



Map M-30

No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

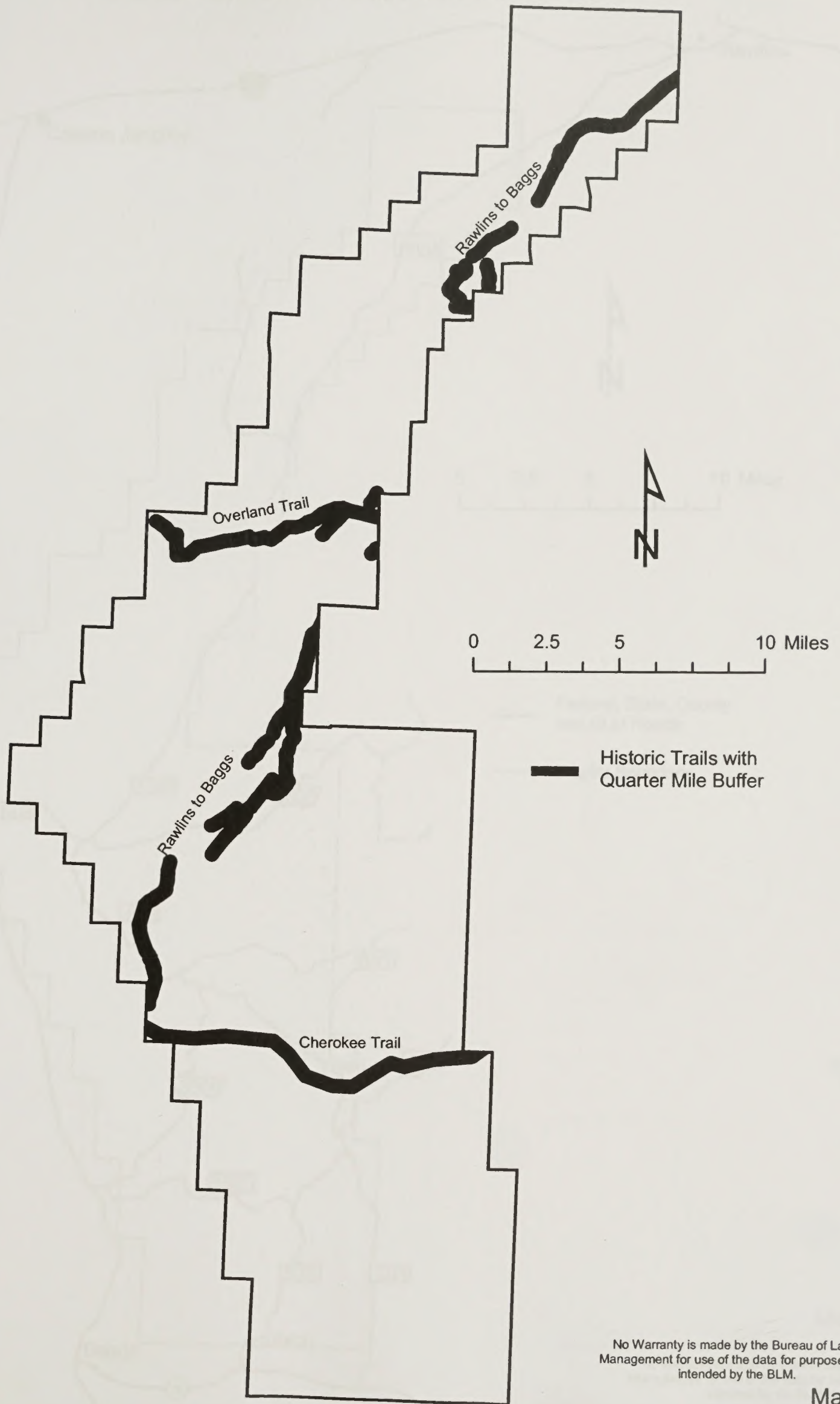
ATLANTIC RIM FINAL EIS MAP
Visual Resource Management Classes



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ATLANTIC RIM FINAL EIS MAP

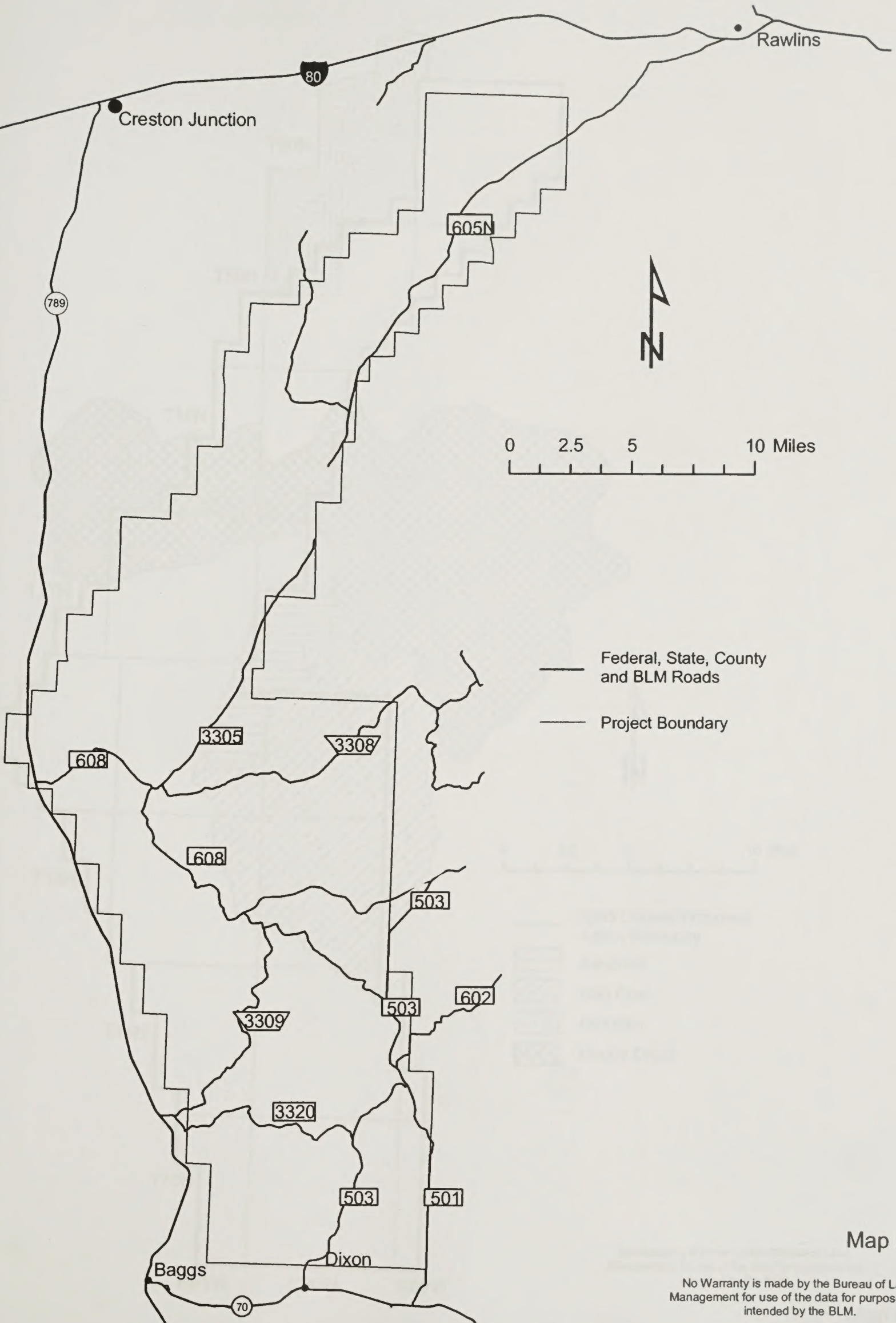
Historic Trails with Quarter Mile Buffer



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ATLANTIC RIM FINAL EIS MAP

Federal, State, County, and BLM Roads



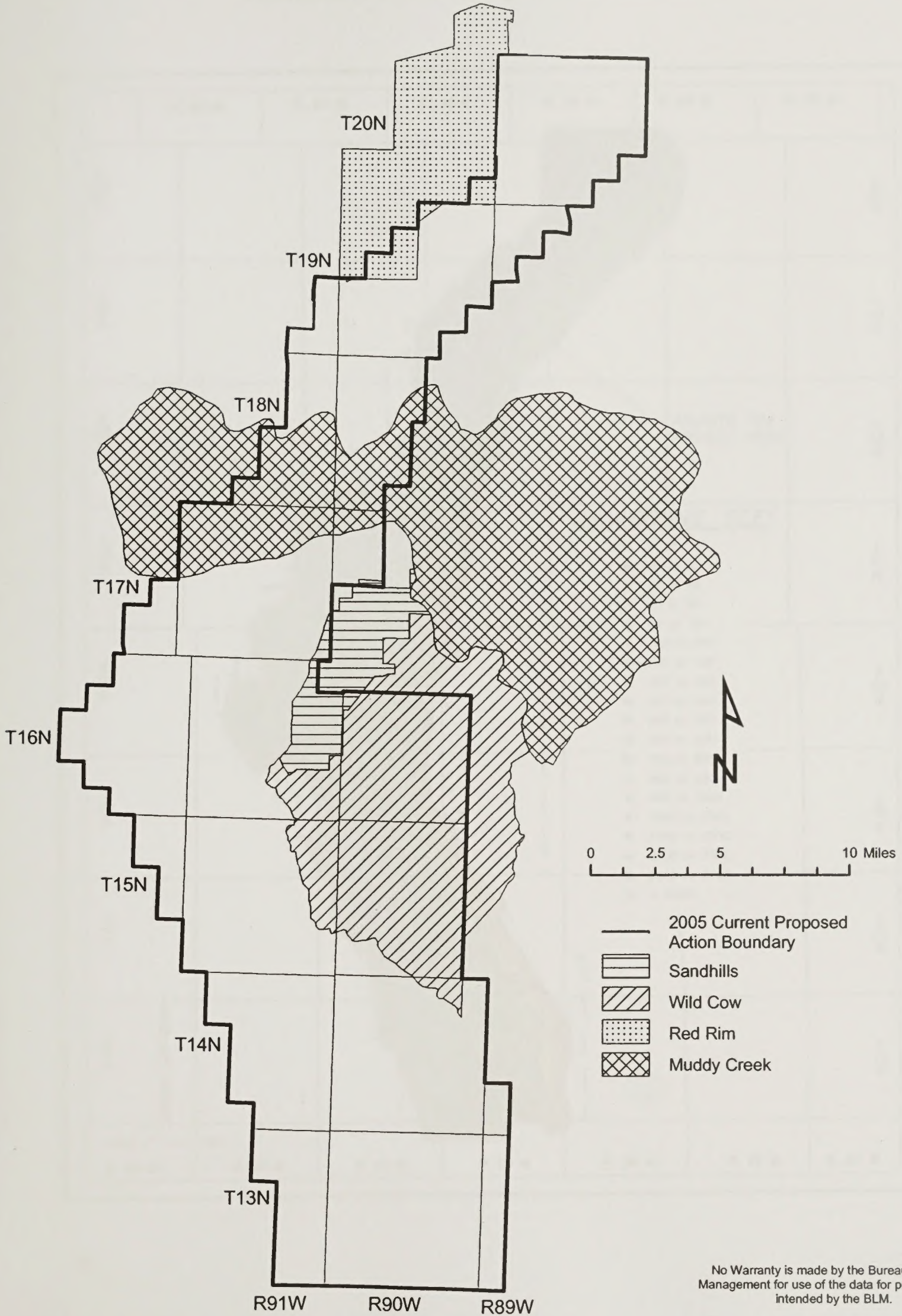
- Federal, State, County and BLM Roads
- Project Boundary

Map M-33

No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

ATLANTIC RIM FINAL EIS MAP

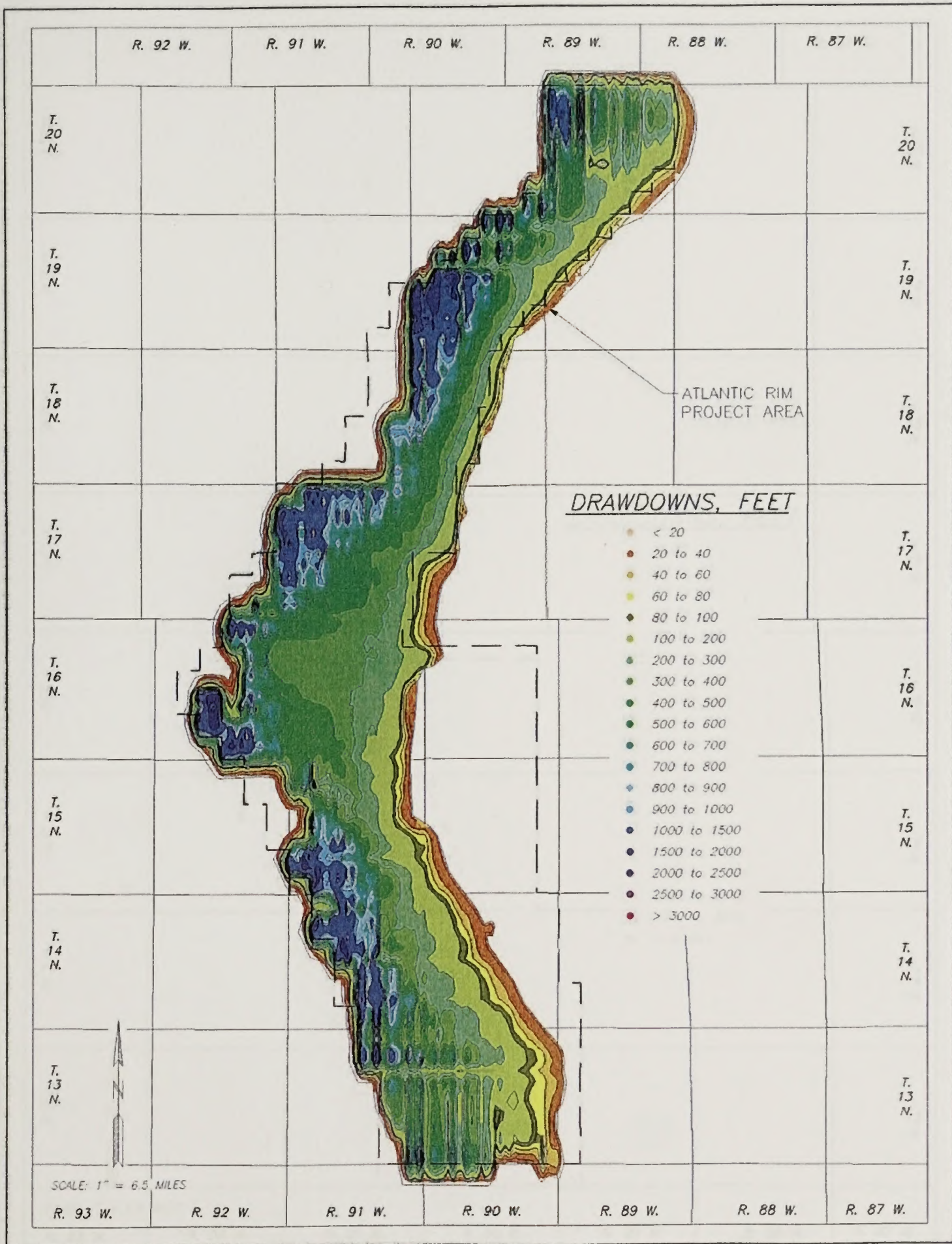
Special Management Areas Overview



No Warranty is made by the Bureau of Land Management for use of the data for purposes not intended by the BLM.

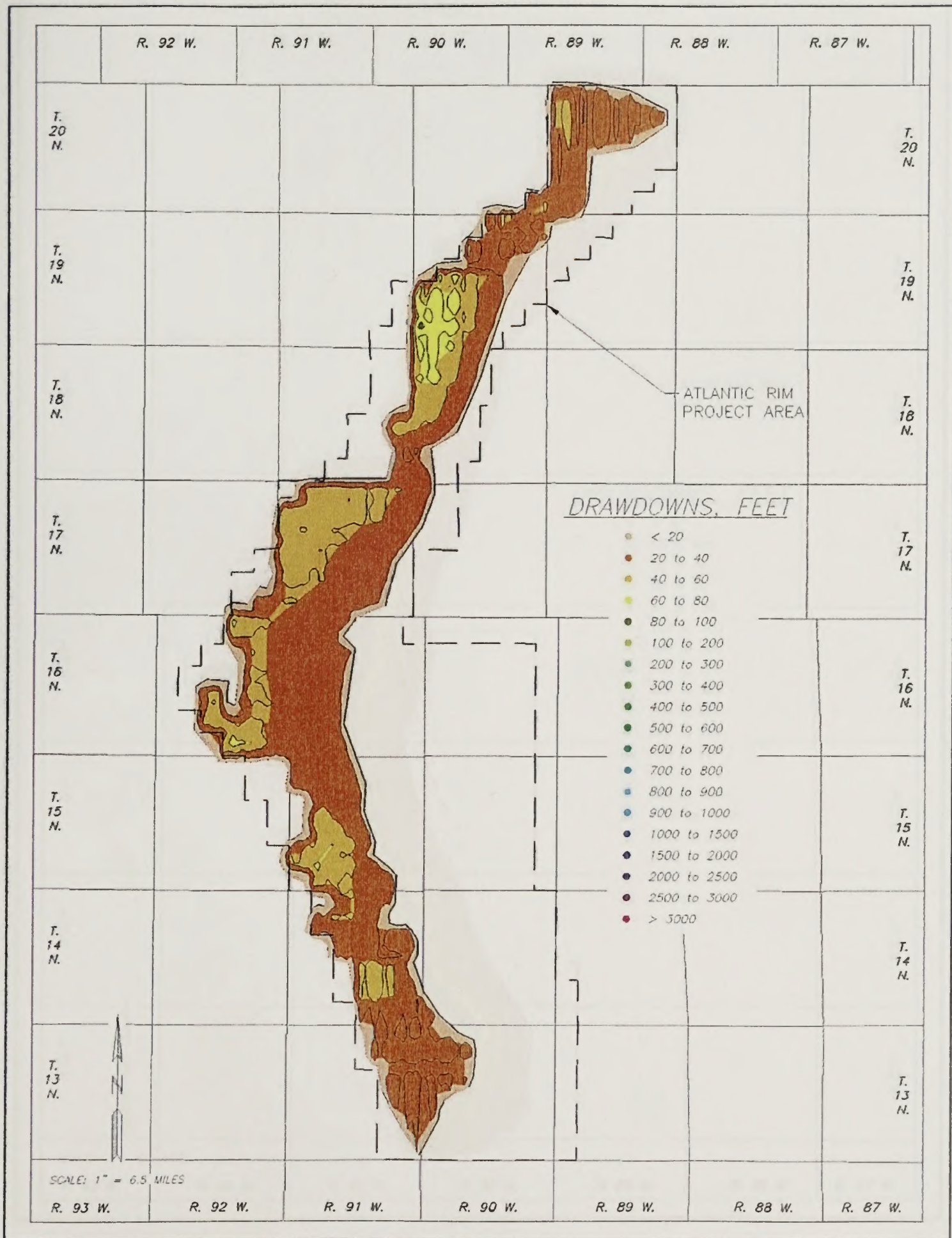
ATLANTIC RIM FINAL EIS MAP

Drawdowns within Layer 3 for Year 2030



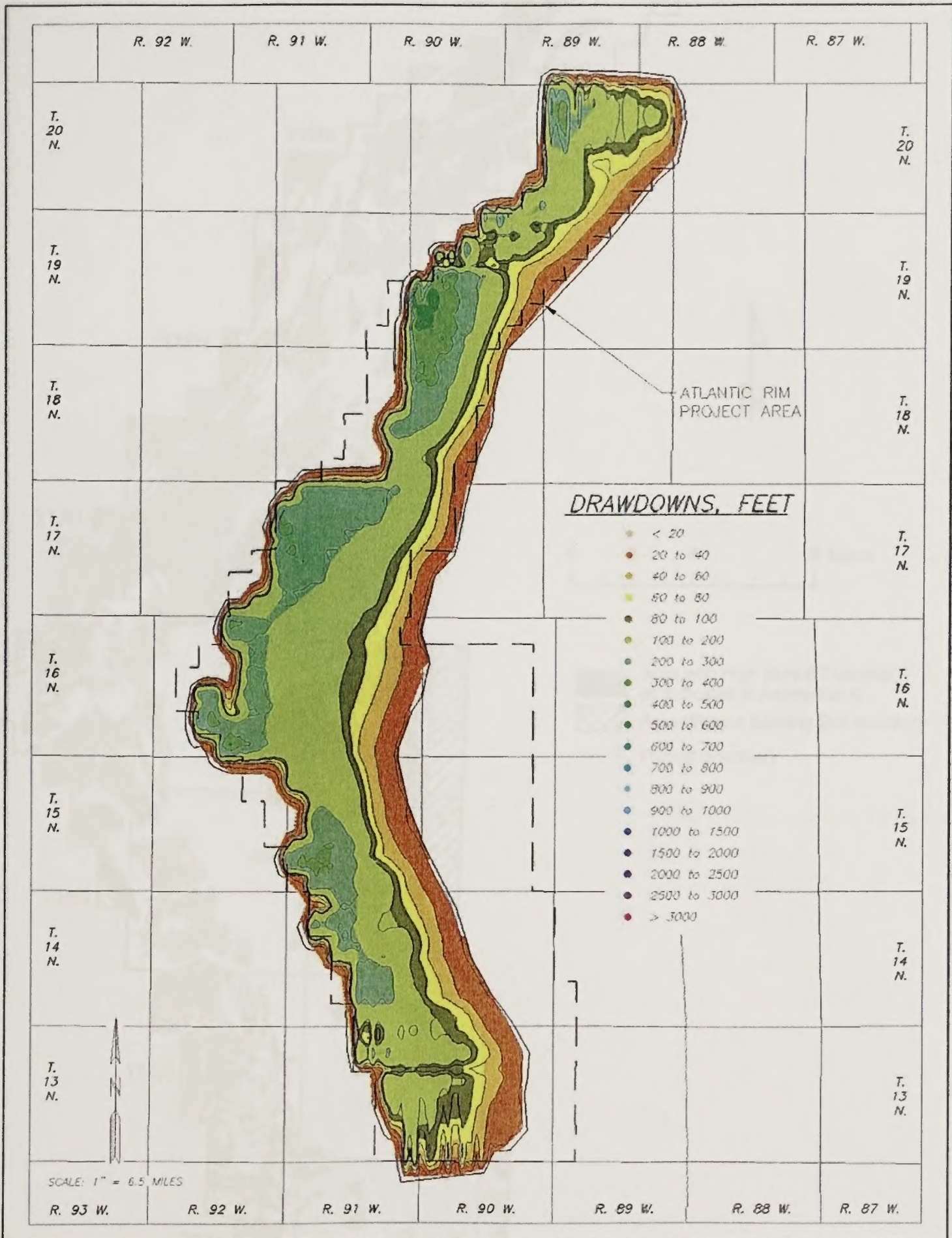
ATLANTIC RIM FINAL EIS MAP

Drawdowns within Layer 1 for Year 2030



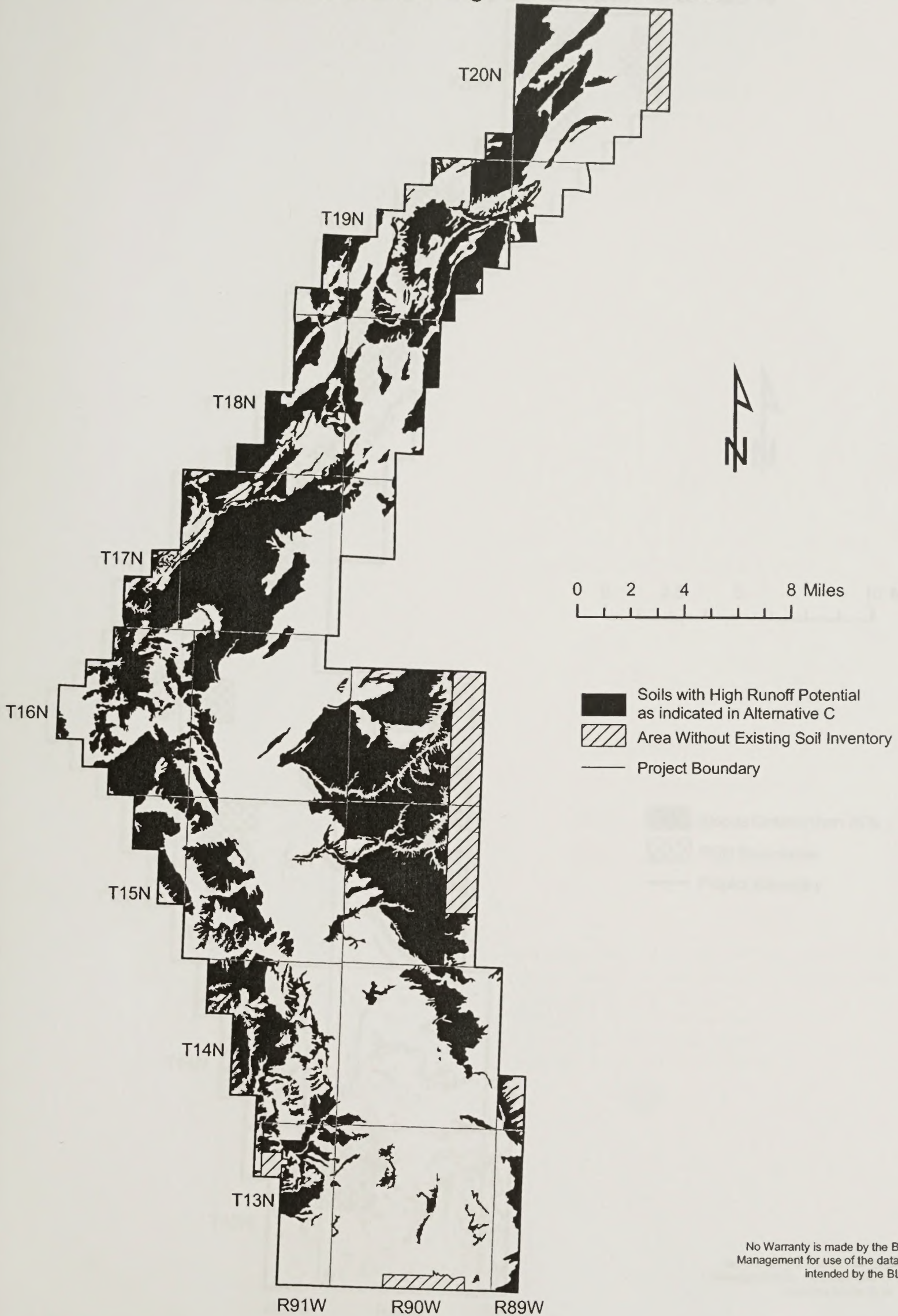
ATLANTIC RIM FINAL EIS MAP

Drawdowns within Layer 5 for Year 2030



ATLANTIC RIM FINAL EIS MAP

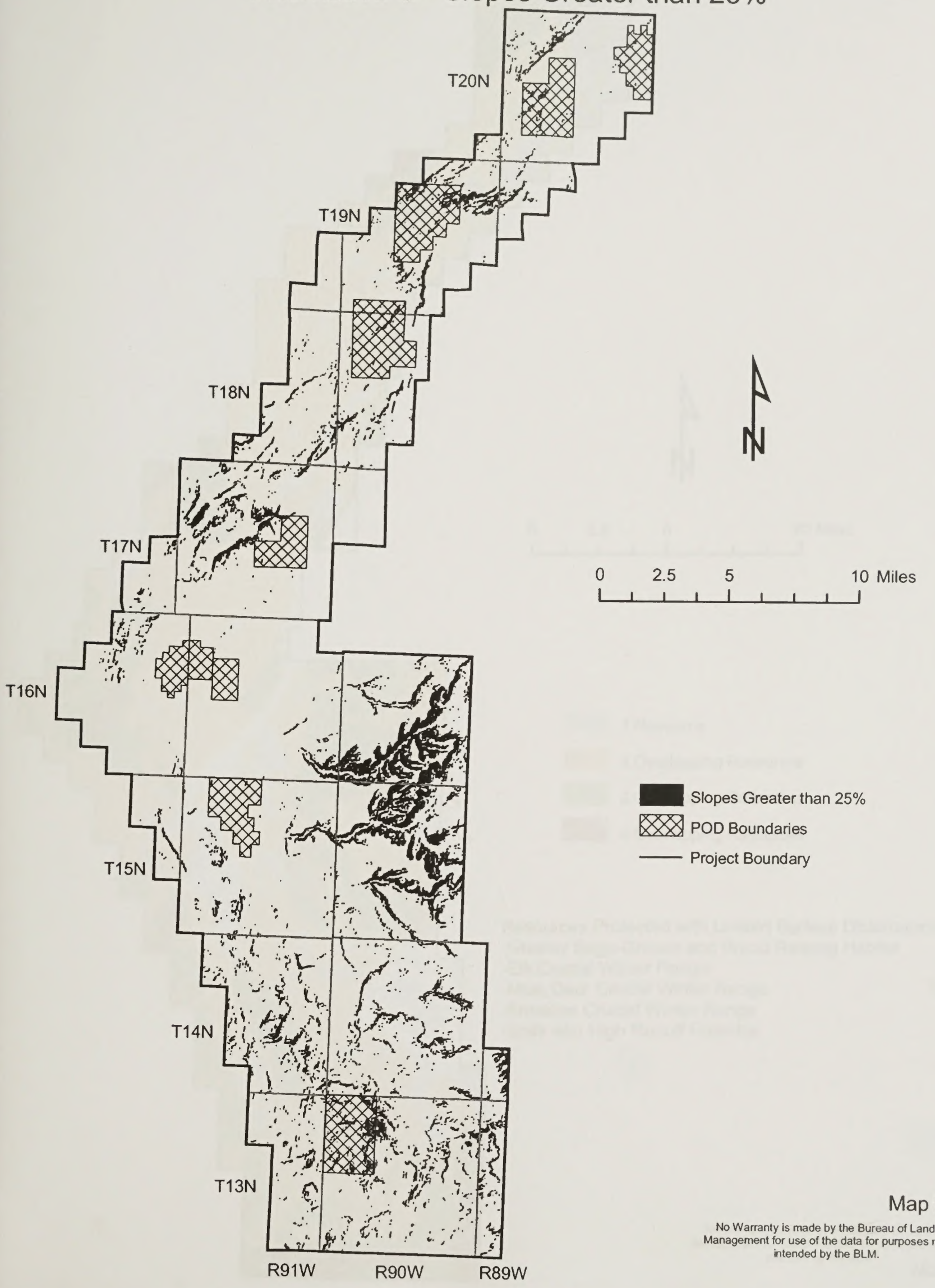
Soils with High Runoff Potential



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ATLANTIC RIM FINAL EIS MAP

Alternative C - Slopes Greater than 25%

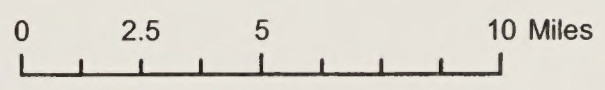






Map M-39

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ATLANTIC RIM FINAL EIS MAP

Alternative C - Resources with Limited Surface Disturbance Mitigation Measure



-  1 Resource
-  2 Overlapping Resources
-  3 Overlapping Resources
-  4 Overlapping Resources

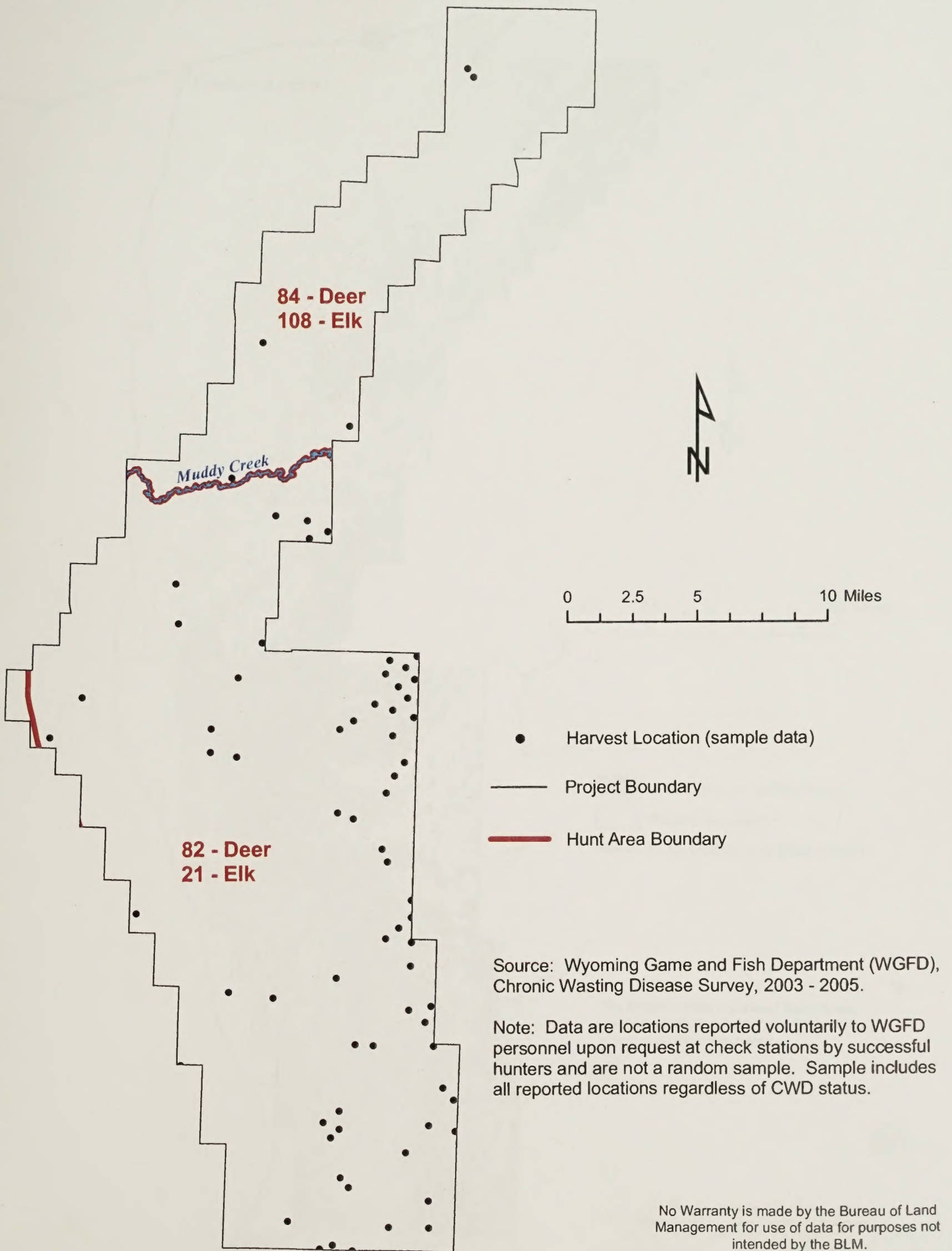
Resources Protected with Limited Surface Disturbance

- Greater Sage-Grouse and Brood Rearing Habitat
- Elk Crucial Winter Range
- Mule Deer Crucial Winter Range
- Antelope Crucial Winter Range
- Soils with High Runoff Potential

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ATLANTIC RIM FINAL EIS MAP

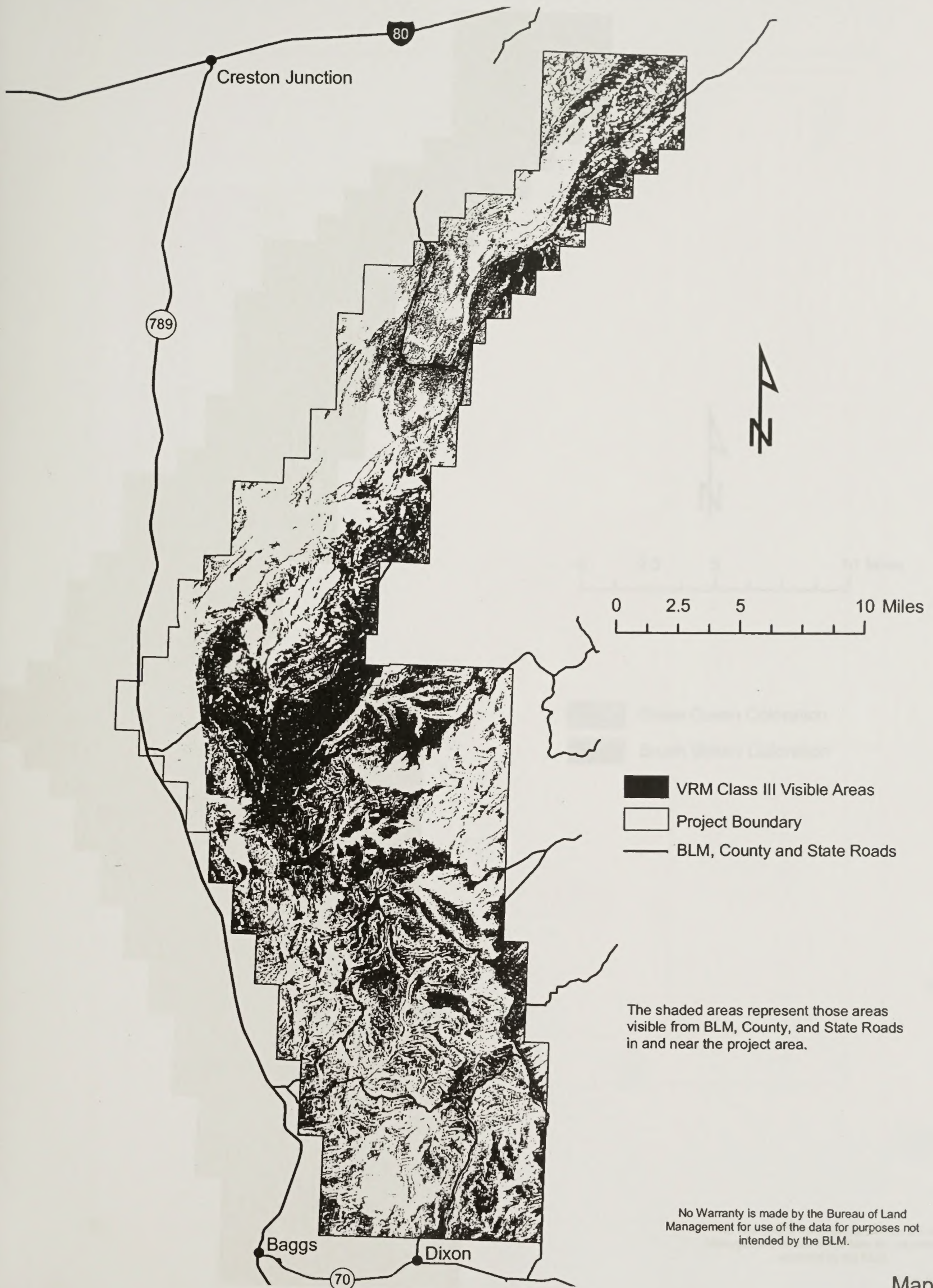
Locations of Successful Hunts



No Warranty is made by the Bureau of Land Management for use of data for purposes not intended by the BLM.

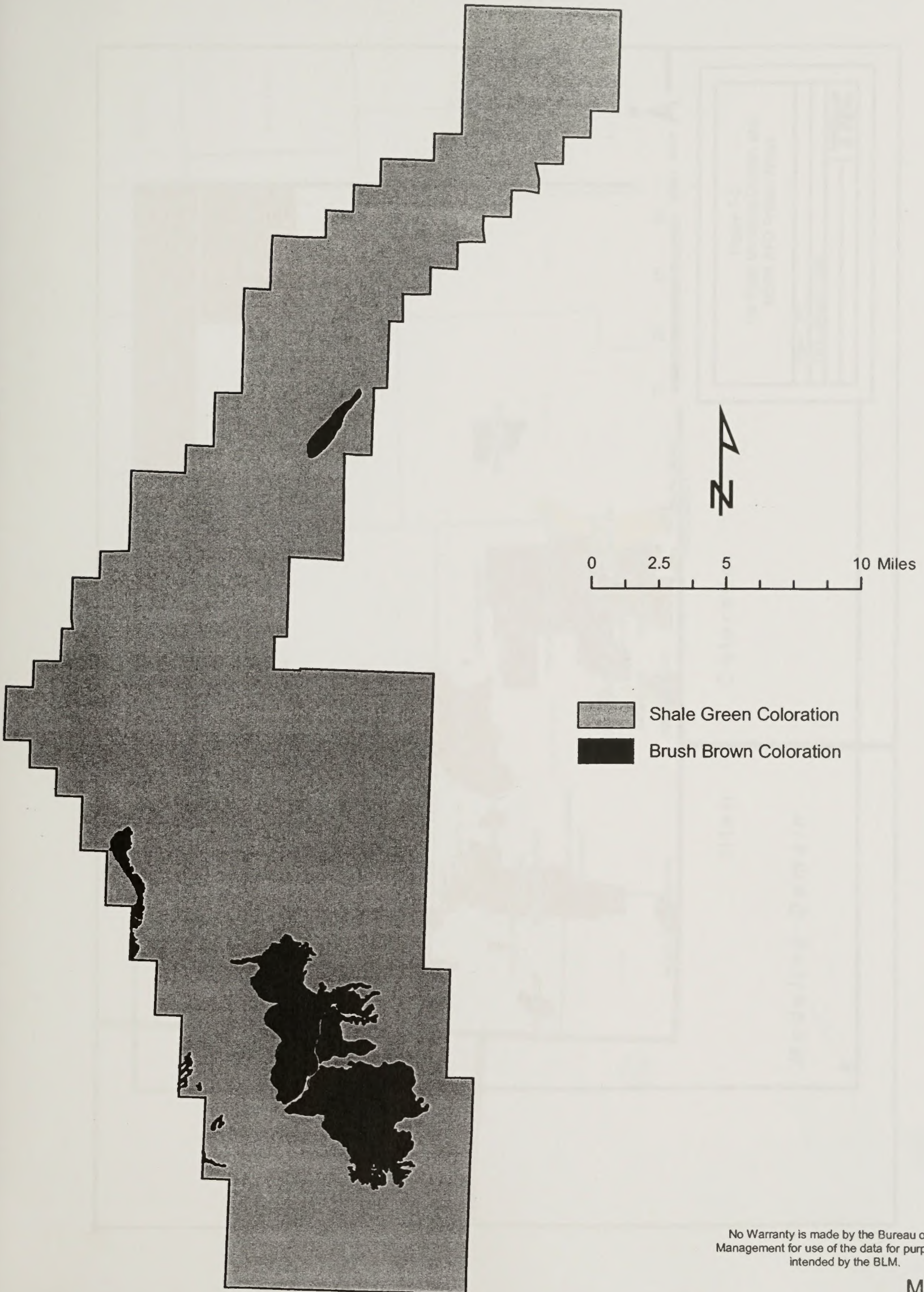
ATLANTIC RIM FINAL EIS MAP

Areas Visible from Main Roads in VRM Class III with slopes <5%



ATLANTIC RIM FINAL EIS MAP

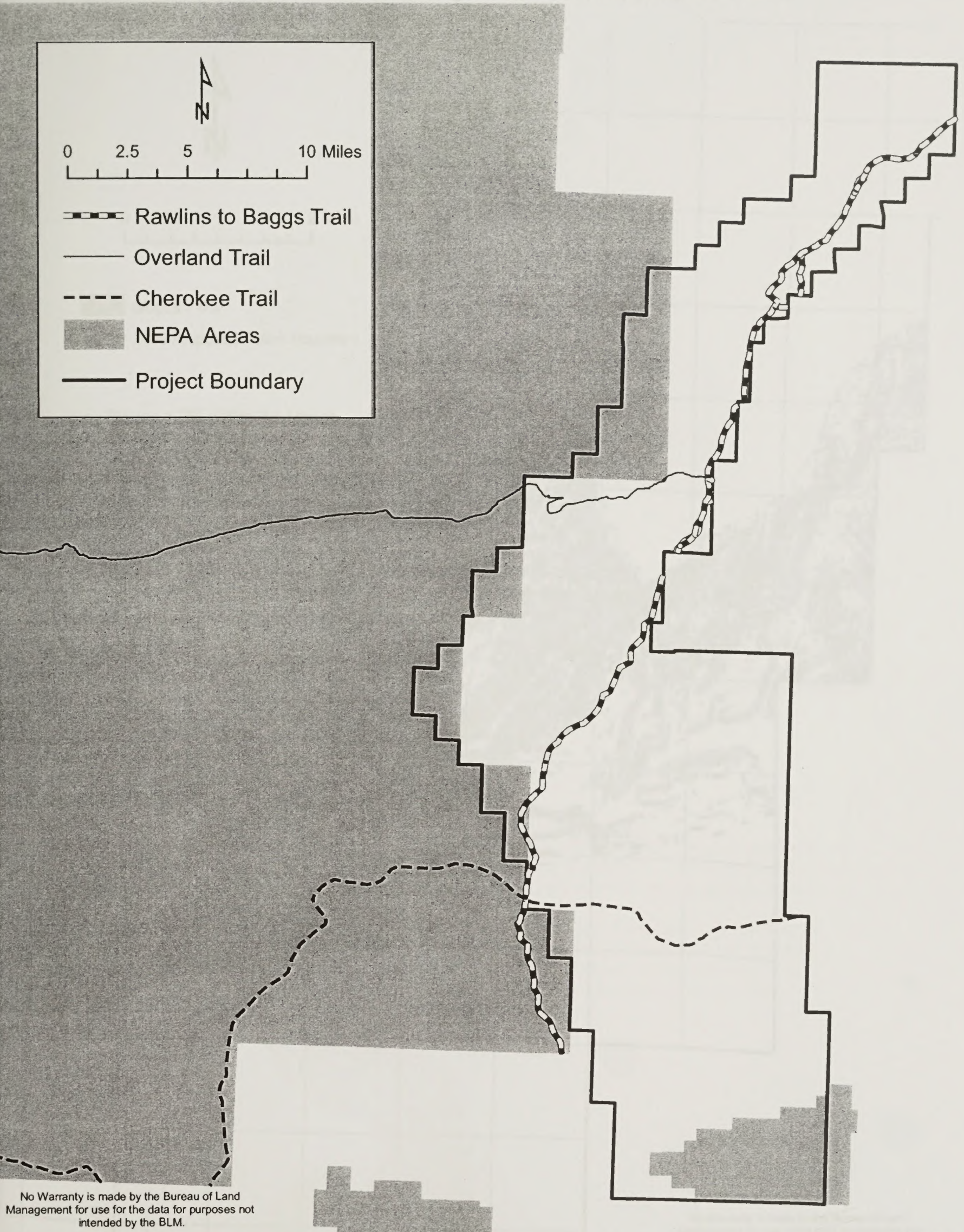
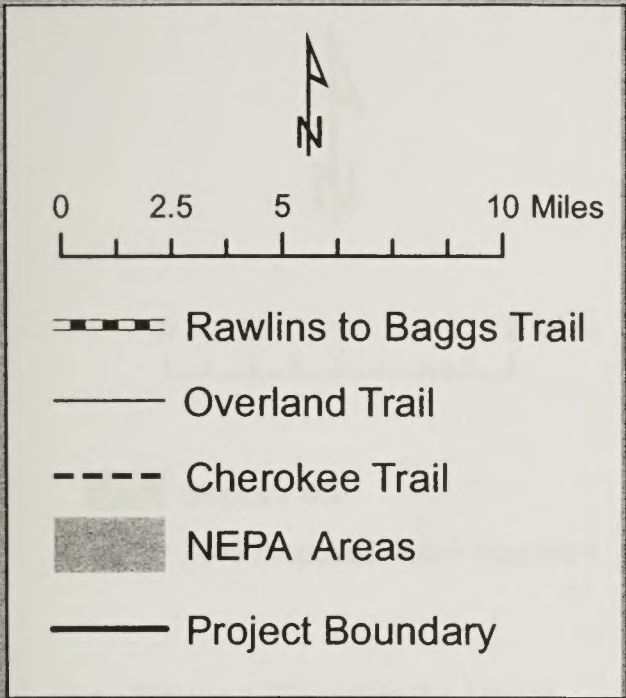
Project Area Facility Coloration



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ATLANTIC RIM FINAL EIS MAP

Cumulative Impacts Historic Trails





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ATLANTIC RIM FINAL EIS MAP

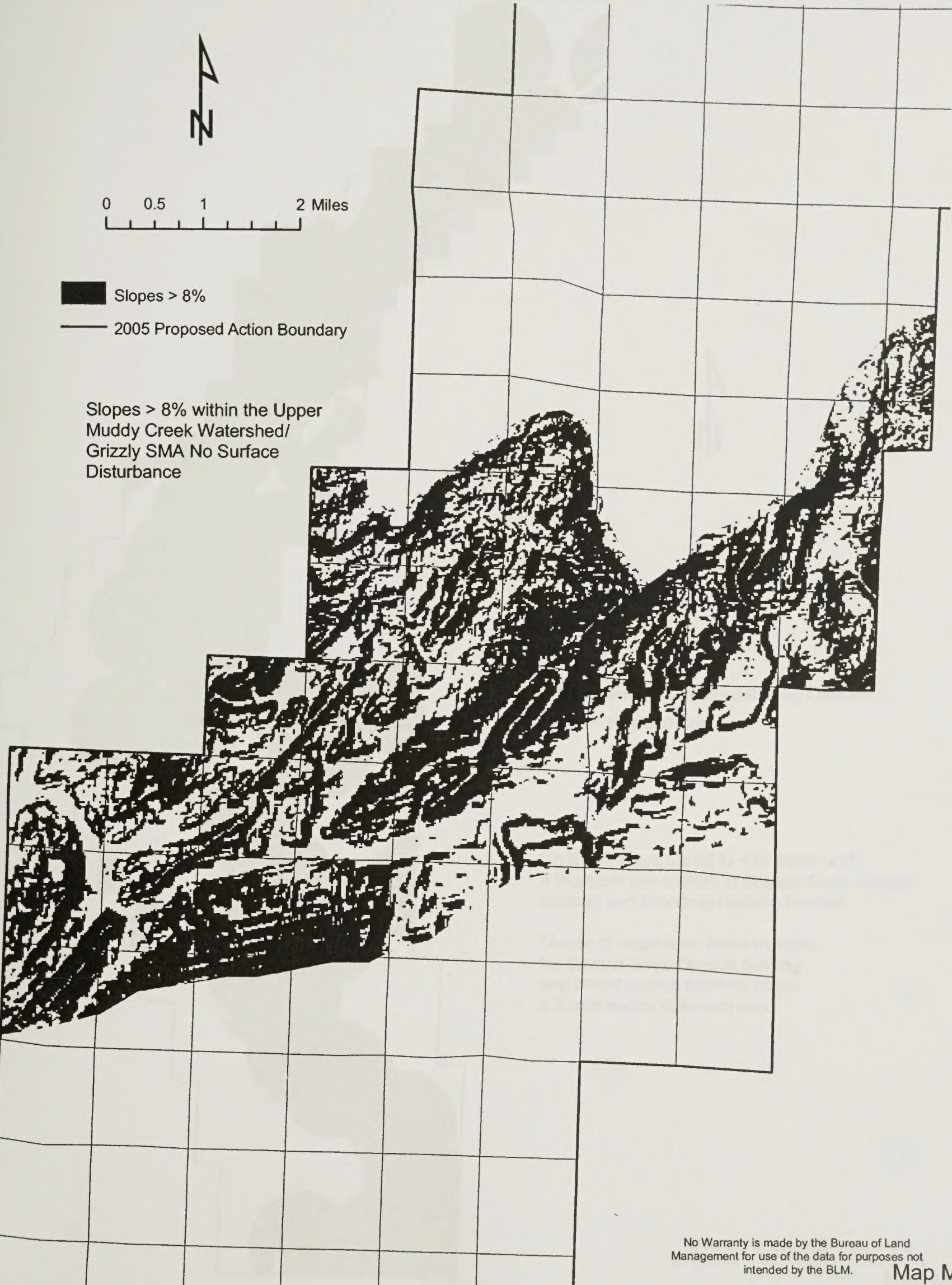
Alternative C - Muddy Creek SMA Slopes > 8%



0 0.5 1 2 Miles

-  Slopes > 8%
-  2005 Proposed Action Boundary

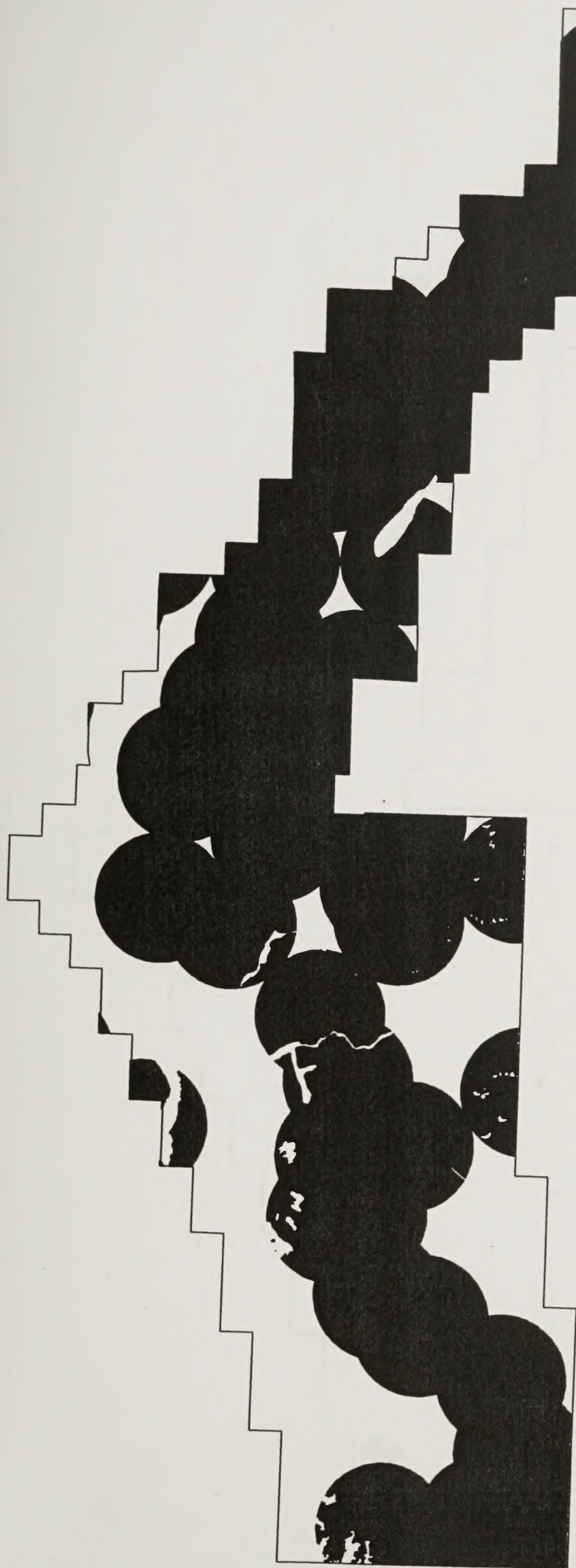
Slopes > 8% within the Upper Muddy Creek Watershed/ Grizzly SMA No Surface Disturbance





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ATLANTIC RIM FINAL EIS MAP

Alternative C - Greater Sage-Grouse Nesting and Brood-Rearing Habitat



0 2.5 5 10 Miles

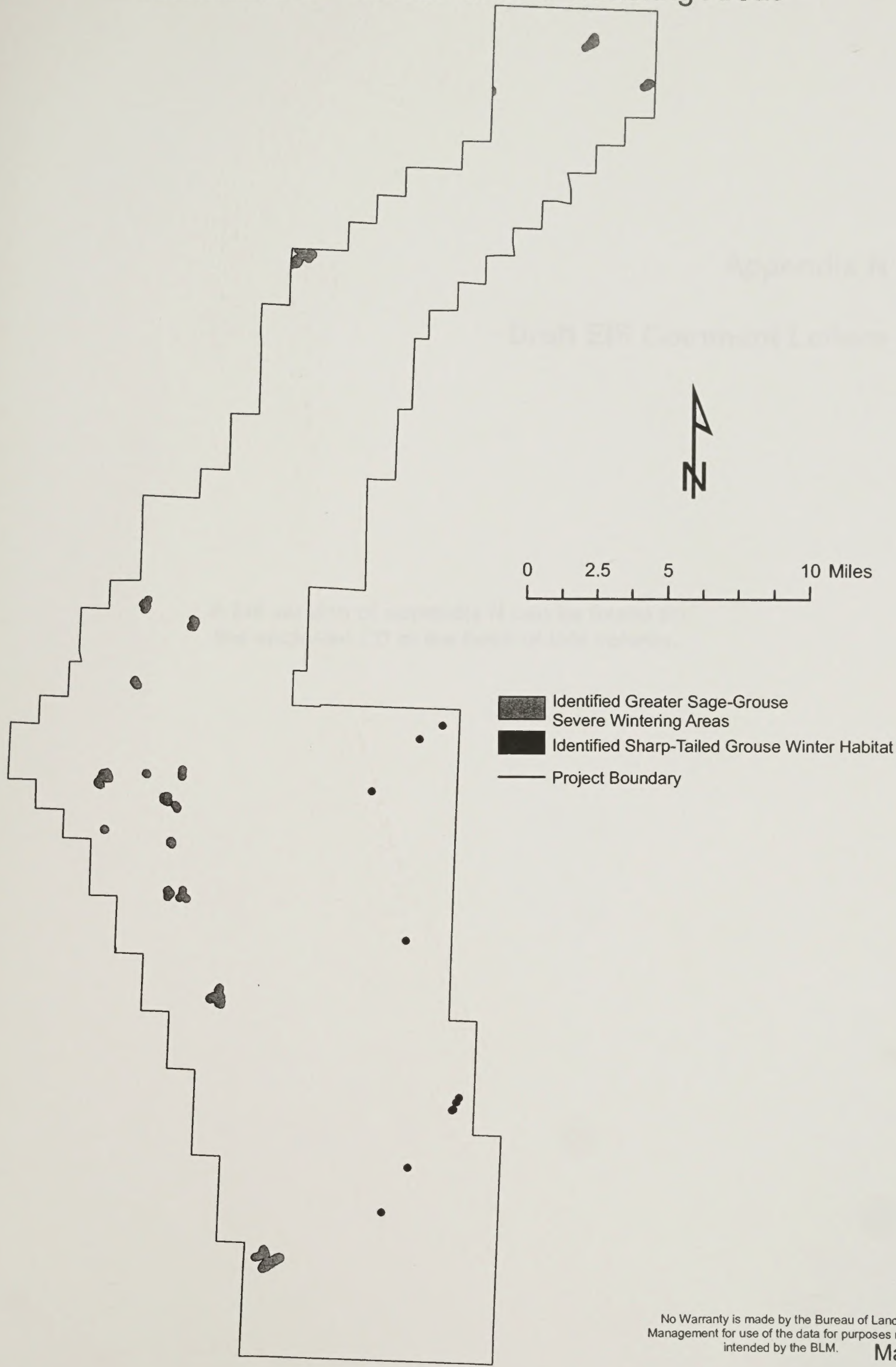
-  Nesting and Brood Rearing Habitat*
-  Project Boundary

Limit disturbance total to <20 acres and 4 locations per section in Greater Sage-Grouse Nesting and Brooding-Rearing Habitat.

*Areas of vegetation types useable for Greater Sage-Grouse nesting and brood rearing habitats within a 2 mile radius of known leks.

ATLANTIC RIM FINAL EIS MAP

Alternative C - Grouse Critical Wintering Areas



Appendix N

Draft EIS Comment Letters

**A full version of appendix N can be found on
the enclosed CD at the back of this volume.**

APPENDIX N

DRAFT EIS COMMENT LETTERS

Atlantic Rim Draft EIS Comment Analysis Process

Introduction

In December 2005, the Bureau of Land Management (BLM), Rawlins Field Office (RFO) released a Draft Environmental Impact Statement (DEIS) for the proposed Atlantic Rim Natural Gas Development Project. On December 12, 2005, a Notice of Availability (NOA) for public review and comment on the DEIS was published in the *Federal Register* (Volume 70, No. 237, pp. 73481–73482). The DEIS was distributed in both paper and electronic formats (on CD-ROM), and was available for downloading from the BLM's website at www.wy.blm.gov. Additional copies of these volumes were made available for public inspection at the RFO, 1300 N. Third St., Rawlins, WY, and at the BLM Wyoming State Office, 5353 Yellowstone Road, Cheyenne, WY. The BLM invited public and agency comment on the DEIS and technical support documents for a period of 60 calendar days.

The purpose of this narrative summary is to provide the numbers and types of comments that were received during the comment period for the DEIS and to describe the process by which all comments were analyzed to determine their relevance and significance for subsequent revision of the document. In addition, this summary describes the comment tracking procedures used for preparation of the final EIS along with the organization of appendices N and O to assist the reader in locating specific letters/comments and BLM responses.

The Public Comment Process under NEPA

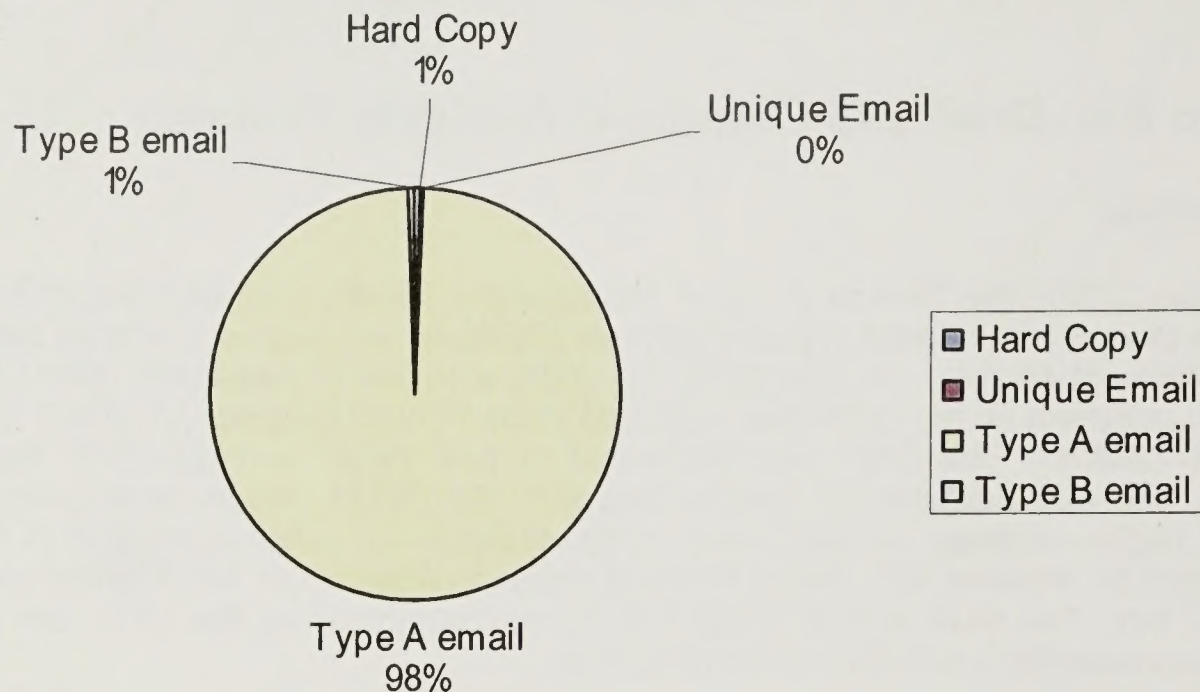
Solicitation of public comment on draft plans for major federal actions is required under the National Environmental Policy Act (NEPA). Specifically, the BLM and other federal agencies must "assess and consider [the resulting public] comments both individually and collectively" (Title 40 Code of Federal Regulations [CFR] 1503.4). Comments received on the Atlantic Rim DEIS are viewed as critical to helping the BLM modify or clarify, as necessary, the existing alternatives and the preferred alternative to best suit the purpose and need for the project in light of public, project sponsor, and cooperating agency input; to potentially develop and evaluate new alternatives; to supplement, improve, or modify the existing environmental analyses; and to correct factual errors in the DEIS.

Overview of Comments Received

During the 60-day comment period for the Atlantic Rim DEIS, BLM's RFO received over 59,400 individual comment letters including approximately 59,100 email and 300 hard copy comment letters (figure N-1). Comments were received from state, federal and local agencies, environmental advocacy groups, landholders, leaseholders, oil and gas companies, and the public. Some comment letters were submitted in both hard copy and electronic form creating a small number of duplicate letters.

Appendix N. Draft EIS Comment Letters

Figure N-1. Comments by Submittal Type.



The large number of email comments were divided into the following three groups:

1. Type A: Form email submitted via the Natural Resources Defense Council (NRDC) website <http://nrdc.org/>.
2. Type B: Form email.
3. Unique: Email prepared by individuals or organizations containing predominantly original material (e.g. not a form email).

Process for Tracking and Analyzing Public Comments

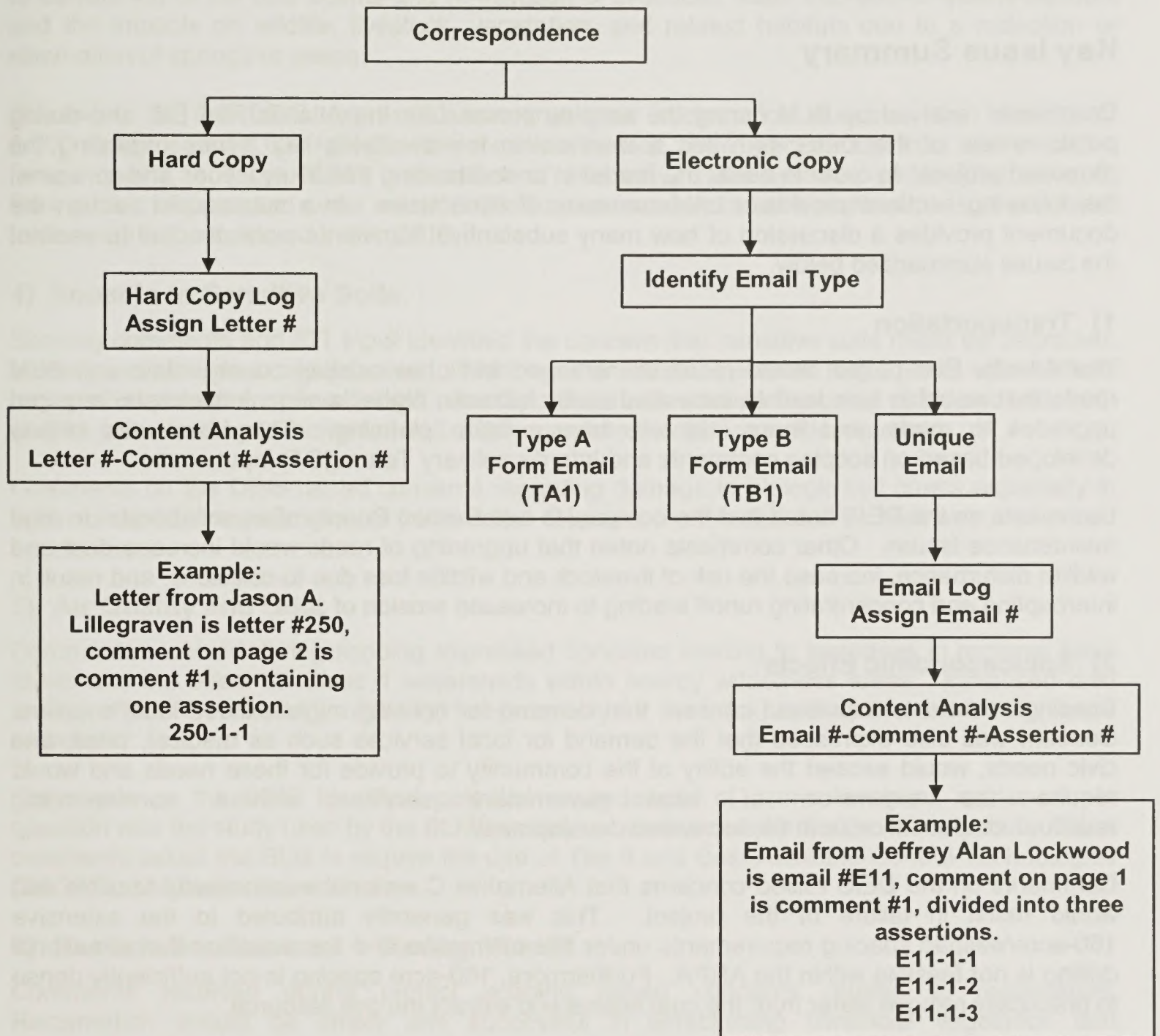
Public comments play an integral role in the NEPA process. The process for tracking and analyzing public comments is shown in figure N-2 and outlined below. Comments to the Atlantic Rim DEIS were categorized by their form of submittal: hard copy or electronic (email). Each hard copy letter was assigned a unique identifying number and recorded on a tracking log.

Comments submitted electronically were categorized as a unique email, or as form email Type A or Type B. Each unique email was assigned an identifying number with a preceding letter "E" (e.g. E1, E2, etc.) and recorded on a tracking log. The first instance of form email Type A and Type B were designated TA1 and TB1 respectively.

BLM analyzed each letter, unique email, and form emails TA1 and TB1 to identify potentially substantive comments through a process referred to as Content Analysis. Where deemed appropriate, complex comments were further divided into individual assertions. Comments and assertions within each letter or email were assigned sequential numbers (See figure N-2). Through this process BLM identified approximately 1,960 individual substantive comments and assertions within the comment letters.

Appendix N. Draft EIS Comment Letters

Figure N-2. Comment Management Process Flow Chart.



Content Analysis Annotation

The Content Analysis process was used to identify significant comments and assertions that may require a response from BLM. Significant comments and assertions are identified electronically on the original correspondence (appendix N), along with their unique identifier by highlighting individual comments. If a complex comment is further divided into individual assertions, the assertions are underlined. The letter/email identifier, comment number and assertion number are annotated in the left hand margin of the correspondence. Letters and email may contain comments similar to other letters. In these cases BLM may refer to a previous response, e.g. "Please refer to our response to letter number (insert the appropriate

Appendix N. Draft EIS Comment Letters

letter number).” Form emails TA1 and TB1 contain the comment annotations for all Type A and Type B correspondence.

Key Issue Summary

Comments received by BLM during the scoping process for the Atlantic Rim EIS and during public review of the DEIS, provided a mechanism for identifying key issues regarding the proposed project. In order to assist the reader in understanding these key issues and concerns, the following sections provide a brief summary of each issue. In a subsequent section the document provides a discussion of how many substantive comments were directed to each of the issues summarized below.

1) Transportation

The Atlantic Rim project would result in increased traffic on existing county, state and BLM roads that would in turn lead to increased traffic hazards, higher maintenance costs, required upgrades to roads, and more intensive transportation planning. This issue was initially developed based on scoping comments and Interdisciplinary Team (IDT) input.

Comments on the DEIS noted that the companies and Carbon County often collaborate on road maintenance issues. Other comments noted that upgrading of roads would increase dust and wildlife disturbance, increase the risk of livestock and wildlife loss due to collisions, and result in intercepting and concentrating runoff leading to increased erosion of soils.

2) Socioeconomic Effects

Scoping comments expressed concern that demand for housing might exceed local supplies. Concern was also expressed that the demand for local services such as medical, retail, and civic needs, would exceed the ability of the community to provide for these needs and would require the expansion of local government services without corresponding revenue/compensation from the increased development.

Comments on the DEIS raised concerns that Alternative C was not economically feasible and would result in failure of the project. This was generally attributed to the extensive 160-acre/wellpad spacing requirements under this alternative and the assertion that directional drilling is not feasible within the ARPA. Furthermore, 160-acre spacing is not sufficiently dense to practically remove water from the coal seams and extract the gas resource.

3) Impacts to Surface Water (SW) and Groundwater (GW)

Scoping comments and Interdisciplinary Team input identified several issues relating to hydrology. For surface waters, concern was raised over the production and potential discharge of large amounts of water produced from coal formations into the Colorado River System, changes in water quality and its effects on sensitive fish species within Muddy Creek, and streambed erosion resulting from continuous discharge of produced water into ephemeral and intermittent stream courses.

For surface hydrology, concerns were expressed that roads and road density could intercept and concentrate overland flow, resulting in erosion and impacts to water quality. In addition, accelerated erosion could increase sediment and salt delivery to the Colorado River system.

Appendix N. Draft EIS Comment Letters

For groundwater, concerns were raised regarding potential impacts to groundwater aquifers due to dewatering of the coal seams and re-injection of produced water into poorer quality aquifers and the impacts on wildlife, livestock, vegetation, and related habitats due to a reduction or elimination of springs or seeps.

Comments to the DEIS expressed concerns over reclamation success, the impacts of 2,000 wellpads and 1,000 miles of new roads on erosion, the impact of dust from new roads on forage quality, and the BLM's exploration of alternative road systems under Alternative C. Re-injection of produced water was identified as an issue because beneficial uses of produced water were not considered in the DEIS.

4) Impacts to Sensitive Soils

Scoping comments and IDT input identified the concern that sensitive soils might be degraded, eroded, or otherwise compromised. Among the issues identified were soils with difficult reclamation potential, soils with high run-off potential with attendant erosion risks, and soils with excess salts, leading to increased salt discharges into the Colorado River system.

Comments on the DEIS raised concerns regarding damage to biologic soil crusts especially in light of long-term regeneration of these soils. Deposition of eroded soil as dust was also raised as an issue.

5) Air Quality and Dust

Comments received during scoping expressed concerns relating to increases in regional haze levels and the effect on Class 1 watersheds within nearby wilderness areas. Increased dust and its effects on air quality, visibility, forage quality for livestock, and wildlife and erosion were expressed.

Comments on the DEIS identified potential exceedances of ozone levels as an issue. In question was the study used by the BLM to analyze ozone levels for the proposed action. Other comments asked the BLM to require the use of Tier II and Best Available Control Technologies (BACT) to reduce project emissions.

6) Reclamation Success – Timing, Weeds

Comments received during project scoping raised concerns related to reclamation. Reclamation should be timely and successful in establishing beneficial vegetation and stabilizing soils. Care should be taken to prevent weed infestations, which is also important for successful reclamation. Immediate soil stabilization is an issue, pending initiation of reclamation the first growing season. Geospatial tracking of reclamation progress, adaptive management, and annual monitoring were also identified as needs.

Comments to the DEIS detailed the importance of successful reclamation in reducing adverse effects on livestock, wildlife, erosion, dust, soil quality, and visibility. Observations by IDT members, cooperating agencies, and the public showed that reclamation has been uniformly unsuccessful within the Atlantic Rim pods. Numerous attempts to plant and grow vegetation failed, potentially due to many factors. Among the problems identified with reclamation were drought, unavailability of desirable weed-free seed mixtures, the spread of noxious and invasive weeds by construction equipment and machinery, lack of effective weed control in many areas,

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soils with poor reclamation potential, and a short growing season. In some cases reclamation has failed several years in a row.

7) Range - Livestock Management

Scoping comments raised issues related to livestock management. Reduced forage availability from unreclaimed disturbance and dust on vegetation were identified as issues. Other issues included livestock disturbance and harassment due to increased human presence; damage and reduced viability to range improvements, and compromised range and vegetation quality.

Comments on the DEIS raised issues with livestock disturbance, including lambing and calving grounds; grazing and herd movement problems; and damage to range improvements, including cattleguards, riparian areas and fences.

8) Cultural – Special Management Area (SMA), Area of Critical Environmental Concern (ACEC)

Scoping revealed concerns regarding impacts to cultural resources and the resulting risk of exceeding the significance criteria established by the National Historic Preservation Act. Known risks relate to historic trails and sites eligible for the National Register of Historic Places and sites not yet identified or uncovered.

9) Wildlife - Big Game/Grouse/Raptors

Wildlife-related issues for big game include protecting and maintaining crucial winter range and identifying and maintaining migration corridors. Sage-grouse-related concerns include identifying and protecting critical winter habitat and nesting/brood-rearing habitats. Raptor populations need to be protected and maintained by providing timing and disturbance restrictions.

Comments received to the DEIS included assertions that the BLM's mitigations were not adequate, that too much disturbance would result in reduced habitat quality and wildlife populations. Concerns were expressed for a large range of wildlife species, including sage-grouse, big game, sagebrush obligate species, sensitive fish, and raptors.

10) Threatened, Endangered (T&E) and Sensitive Species

Of concern were potential impacts to listed or proposed-for-listing threatened or endangered plant and animal species due to potential water depletions to the Colorado River system, effects on downstream listed species, maintenance of critical habitats, and compliance with the Endangered Species Act. Another concern was the impact to sensitive plant and wildlife species, including supporting habitat for endangered fishes within Muddy Creek and preserving or improving water quality.

Comments on the DEIS expressed concerns that long-term habitat loss might contribute to declines in threatened, endangered, and sensitive wildlife and plant species. Further issues were raised regarding the adequacy of BLM mitigation measures for these species, including the approval of exceptions to the 0.25 miles disturbance buffer around sage-grouse leks and effects to greater sage-grouse nesting habitat. Other issues include degradation of water quality in Muddy Creek, lack of reclamation success within the Atlantic Rim pods, effects upon

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migration corridors and big game migration, and the approval of exceptions to mitigation requirements.

11) Cumulative Effects

The cumulative effects of the Atlantic Rim project, when coupled with the additional on-going and proposed development that is occurring in the area is a concern. Effects to wildlife, socioeconomics, recreation, visual quality, air quality, and other effects were all of concern.

12) Recreation and Visual

Potential conflicts were identified between the proposed action and recreational activities, including big game hunting, compatibility with traditional uses of the area, impacts to visual resources, and the potential for decreased recreational opportunities.

13) Well Spacing and Directional Drilling

Comments received on the DEIS raised concerns regarding a lack of analysis in the document on the alternative to implement directional drilling rather than vertical drilling of wells. Directional drilling of multiple wells from a single wellpad would reduce overall area and wildlife disturbance. Directional drilling is a common activity in other areas, but is not considered viable in the Atlantic Rim area due to the shallow depth of the target coal seams, geologic conditions, and the physical process of extracting water and coal bed natural gas.

Well spacing is considered an important factor as well. Data from pilot testing, collected during the interim drilling period, indicate that well spacing needs to be at least 8 wells/section to provide for maximum recovery of the gas resource. Alternative C would restrict development to 4 wellpads/section in many areas, which the companies assert would result in uneconomic conditions and failure to extract the maximum amount of recoverable gas.

14) Phased Development

Phased development was evaluated in the DEIS as Alternative B. Under this alternative the Atlantic Rim project would be separated into three areas, each roughly similar in size. One area at a time would be developed, focusing construction activities within this area, but leaving the other areas undisturbed or in the operational phase of producing gas. Comments from the companies and others pointed out the BLM's policy to provide reasonable access to private lands across federal lands, and that the phased alternative would have the effect of denying such access for 7 to 14 years. Additional comments stated that it is unreasonable to preclude drilling and extraction of minerals, including natural gas for such a long time period.

Analysis of Letters and Comments

As noted above, BLM received over 59,400 comment letters on the Atlantic Rim DEIS most of which (over 58,500) were received from one website. Of the comment letters, a total of 393 letters were found to be unique. If a letter was evaluated as being the same as or essentially the same as another letter or form email it is not included as part of the 393 unique letters. Of these unique comment letters, the BLM found that 115 letters (or 29 percent; figure N-3) contained substantive comments requiring a response from the agency. Those letters with substantive comments were further evaluated as illustrated in figures N-4 through N-6. Figure N-4 categorizes the letters based on the key issues addressed by the comments in

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each letter. As can be seen from figure N-4, the three key issues most frequently referred to in the comment letters (besides the general category of "other") were spacing/directional drilling, phased development, and wildlife.

Figure N-3. Commentators Submitting Letter with Substantive Comments.

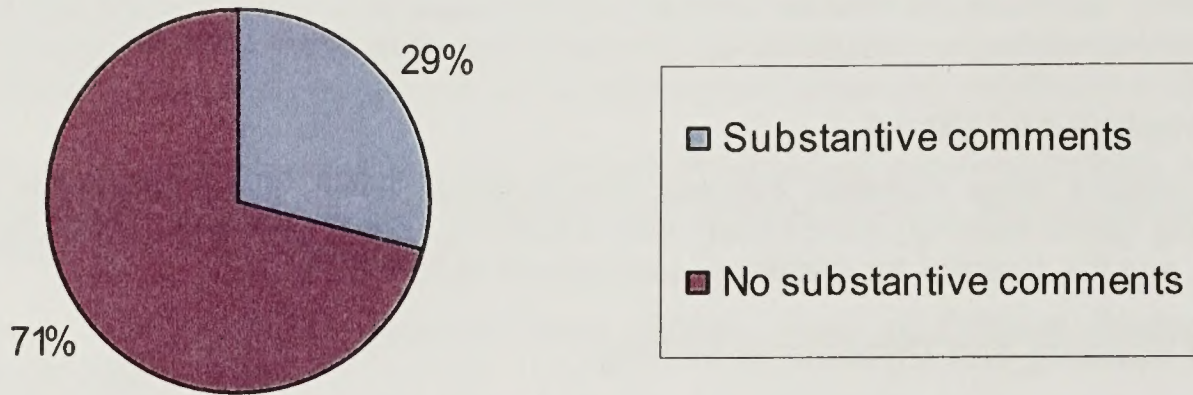
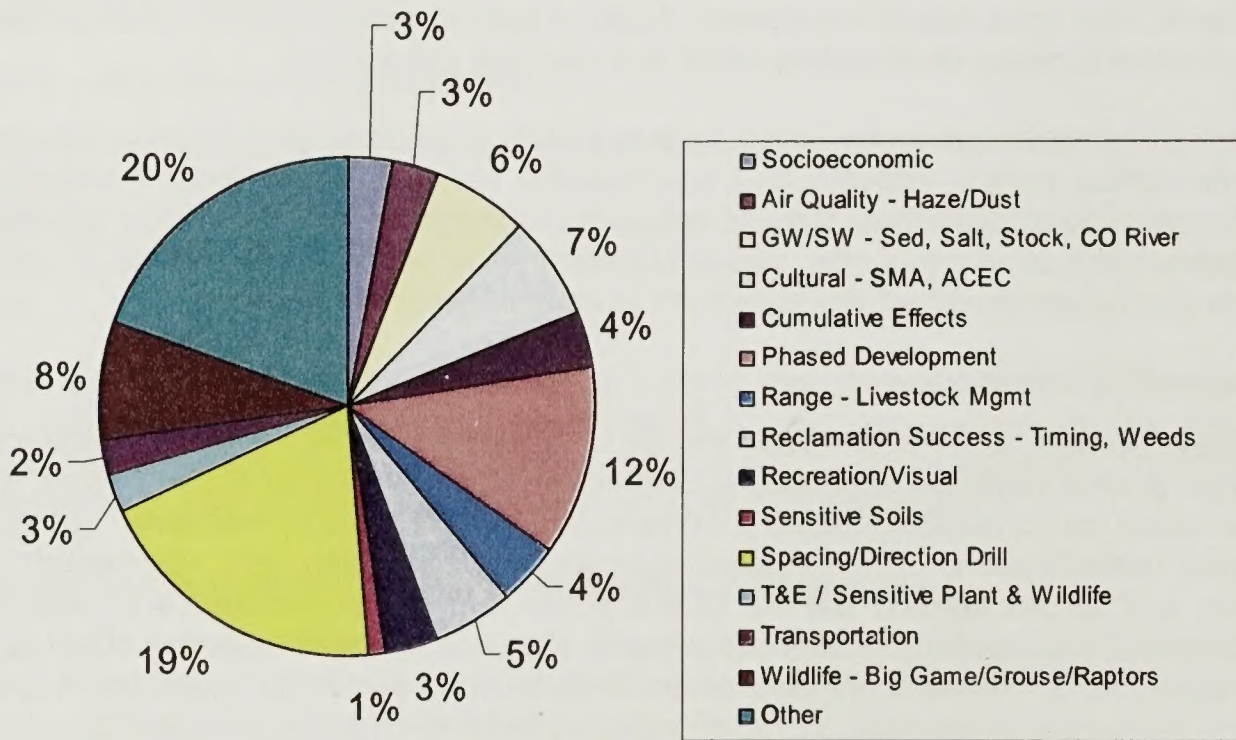


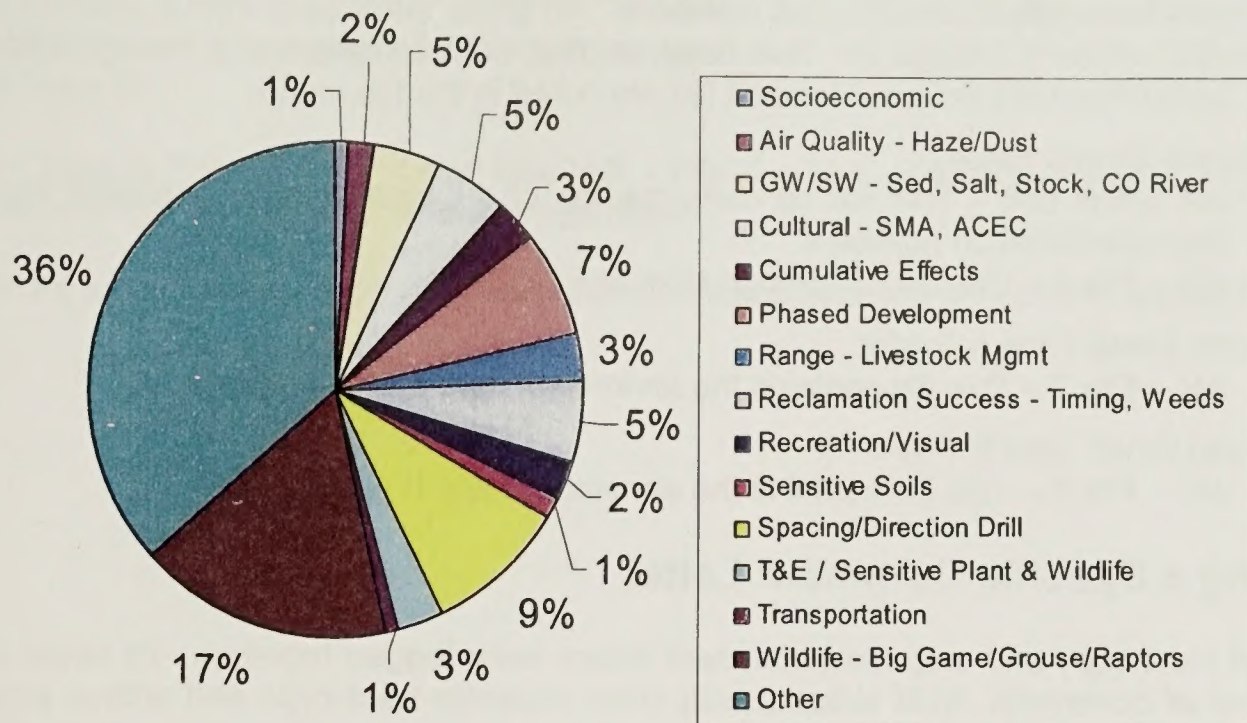
Figure N-4. Total Commentators by Key Issue.



BLM placed the individual substantive comments into categories based on the key issue addressed in the comment. Figure N-5 shows a breakdown of substantive comments by key issue. The three key issues, in descending order, most frequently addressed in the substantive comments (besides the general category of "other") were wildlife, spacing/directional drilling, and phased development.

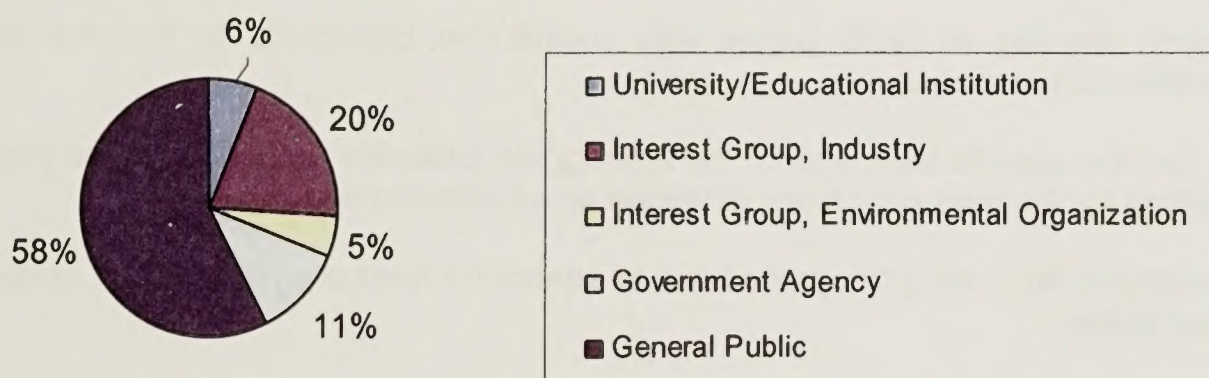
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Figure N-5. Substantive Comments by Key Issue.



Finally, to provide further understanding of the comment letters, BLM placed the letters with substantive comments into categories based upon who sent the comment letter. As can be seen from figure N-6 more than half the letters with substantive comments were received from the public followed in order by industry groups, governmental agencies, universities/educational institutions, and environmental groups.

Figure N-6. Distribution of Commentators with Substantive Comments.



Comment Organization on the Accompanying CD

Letters and email with substantive comments (appendix N) and BLM responses (appendix O) are provided electronically in order to conserve a considerable amount of paper. Comments in appendix N are divided into four categories (folders); hard copy, unique email, Type A form email and Type B form email. The organization of each electronic folder is outlined below.

Appendix N. Draft EIS Comment Letters

1. Hard Copy Folder
 - AR Hard Copy Log – This file contains the log of substantive hard copy letters and their unique identification numbers.
 - AR – Files 1 through 5 – Five separate files contain letters 250 through 684. Letter numbers included in each file are noted in the file name.
2. Unique Emails Folder
 - AR Email Log - This file contains the log of substantive unique emails and their identification numbers.
 - AR – File 6 – Unique E3 through Unique E141
3. Form Email Type A Folder
 - AR – File 7 – This file contains the annotated Type A email - TA1
4. Form Email Type B Folder
 - AR – File 8 – This file contains the annotated Type B email - TB1

Locating a Specific Comment Letter

Initially all hard copy and electronic comment letters were logged together. To better manage the volume of comments, BLM subsequently used separate hard copy and unique email logs, therefore hard copy identification numbers 1–249 are not used as they were electronic submittals. Type A and Type B emails were not logged due to the large volume received. For this Final EIS submittal, only letters with substantive comments are included in appendices N and O. A complete set of comment letters received on the DEIS can be found at the BLM RFO.

The procedure to locate a specific comment correspondence in appendix N for letters with substantive comments is as follows.

1. Determine if you are searching for a hard copy letter or unique electronic email.
2. Search the log of DEIS letters with substantive comments to find the unique identification number.
3. To find the specific letter search the appropriate folder/file (described in the previous section) for the hard copy letter or unique email identification number.

Detailed examples illustrating the procedures to search for hard copy letters and unique emails are provided below.

Hard Copy Letters: If you are searching for a hard copy letter, either open the file “AR Hard Copy Log” located in the Hard Copy folder on the enclosed CD or use table N-1 Log of DEIS Letters with Substantive Comments. Search for the author’s name - substantive letters are listed chronologically by date. Once you have located the author’s name, note the letter identification number. For example the letter from Jason A. Lillegraven is identified as letter number 250. Next, locate the file that contains the letter number, for example letter 250 is located in file “AR-File 1 – Letters 250 through 606.” To locate your letter within the file, open the bookmarks on the left side of the screen, click on your letter number and you will be directed to your letter.

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Unique Email: If you are searching for a unique email submittal, search the file “AR Email Log” on the enclosed CD or table N-1 for the email address of the author. Follow the steps listed above for locating a hard copy letter using file “AR – File 6 – Unique E3 through Unique E141”. If the email address is not found on the unique email log, the email was classified as either Type A or Type B.

Type A or Type B Form Email: Open files “AR – File 7 – TA1” and “AR – File 8 – TB1” to see which letter is similar to the one the author submitted.

Instruction for locating BLM responses to substantive comments are provided in appendix O.

Appendix N. Draft EIS Comment Letters

Table N-1. Log of DEIS Letters with Substantive Comments

Unique Identifying Number	Date Received	Agency, Organization, or Individual
Hard Copy File 1		
250	1/25/2006	Jason A. Lillegraven (letter)
384	1/30/2006	Brian T. Kelly, U.S. Fish and Wildlife Service (letter)
388	2/8/2006	Ray and Kathleen Weber, Weber Ranch Company (letter)
393	2/9/2006	Douglas Arcand (fax)
396	2/9/2006	Loni McKinney (fax)
397	2/9/2006	Harley McKinney (fax)
399	2/9/2006	Jason Dolce (fax)
407	2/9/2006	Corky Faler (fax)
413	2/10/2006	Bill Wichers, Wyoming Game and Fish Department (letter)
416	2/13/2006	Mike Vandenberg (letter)
420	2/13/2006	Alan Hayes (letter)
424	2/13/2006	Brittany Shaklee (letter)
428	2/13/2006	Angela Pacheco (letter)
456	2/14/2006	John Gillaspay (fax)
460	2/14/2006	Lloyd Denton (fax)
466	2/15/2006	John V. Corra, State of Wyoming, Department of Environmental Quality (letter)
470	2/15/2006	Ken Funk (letter)
471	2/15/2006	Art Zeiger, Commissioners of Carbon County (letter)
472	2/15/2006	John A. MacPherson (letter)
476	2/16/2006	Ron Hedlund (letter)
482	2/16/2006	Shaun Foster (letter)
483	2/16/2006	Robin P. Diedrich, Nance Petroleum Corporation (letter)
490	2/16/2006	John Zampedri (fax)
508	2/16/2006	Hollie Butler (letter)
581	2/16/2006	Joyce Allen (letter)
545	2/16/2006	Linda Winner (letter)
547	2/16/2006	Pete A [last name undecipherable] (letter)
548	2/16/2006	[name undecipherable] (letter)
557	2/16/2006	Marie [last name undecipherable] (letter)
581	2/16/2006	Barbara Parsons (letter)
588	2/17/2006	J.B. Anderson (fax)
590	2/17/2006	Bonnie Egbert (fax)
593	2/17/2006	Debbie Rubeck (fax)
598	2/17/2006	Kole Egbert (fax)
603	2/17/2006	Tiffaney Egbert (fax)
605	2/17/2006	Leigh Nation (fax)
606	2/17/2006	D. Steven Degenfelder, Double Eagle Petroleum Company (letter)
Hard Copy File 2		
607	2/17/2006	Tom Clayson, Anadarko Petroleum Corporation (letter)
Hard Copy File 3		
619	2/17/2006	Kathy Staman (letter)
620	2/17/2006	Rowe Anderson (letter)
632	2/17/2006	John P. Lockridge, Mountain Energy, LLC
636	2/17/2006	Laurie Milford and Jeff Rickerl (letter)

Appendix N. Draft EIS Comment Letters

Table N-1. Log of DEIS Letters with Substantive Comments cont.

Unique Identifying Number	Date Received	Agency, Organization, or Individual
Hard Copy File 3		
642	2/17/2006	Jay Linderman (letter)
647	2/17/2006	Laura Lindley, Bjork, Lindley, Little PC, for Redwine Resources, Inc. (letter)
648	2/21/2006	Shane Spear, Sun-West Oil and Gas, Inc. (letter)
652	2/21/2006	Lane Lasrich (letter)
653	2/21/2006	Michel E. Curry (letter)
664	2/21/2006	Jodee G. Pring, State of Wyoming, State Engineer's Office (letter)
665	2/21/2006	Larry Svoboda, U.S. Environmental Protection Agency (letter)
666	2/21/2006	A. William Alldredge, Ph.D. (letter)
Hard Copy File 4		
671	2/21/2006	Erik Molvar, Biodiversity Conservation Alliance (letter)
Hard Copy File 5		
673	2/22/2006	Mark S. Dolar, Dolar Energy, LLC (letter)
674	2/23/2006	Lynn Boomgaarden, State of Wyoming, Office of State Lands and Investments (letter)
675	2/23/2006	John D. Adamson (letter)
678	2/28/2006	John Etchepare, State of Wyoming, Wyoming Department of Agriculture (letter)
681	2/22/2006	Dave Freudenthal, State of Wyoming, Office of the Governor (letter)
682	2/22/2006	Michael A. Saul, National Wildlife Federation (letter)
683	3/2/2006	Jaralyn Beek, Bureau of Reclamation (letter)
684	4/20/2006	D. Steven Degenfelder, Double Eagle Petroleum Company (letter)
Unique Emails File 6		
E3	1/23/2006	Andrew Blair andy_blair@faculty.nols.edu
E4	1/23/2006	Donald Duerr djduerr@hotmail.com
E6	1/28/2006	Jane Robinett jane_robinett@bresnan.net
E7	1/28/2006	Danny Dale ddale@uwyo.edu
E11	2/2/2006	Jeffrey A. Lockwood - Professor of Natural Sciences & Humanities - University of Wyoming Lockwood@uwyo.edu
E13	2/2/2006	Martha Christensen martchris@charter.net
E33	2/9/2006	Gordon James gtjames1940@yahoo.com
E38	2/10/2006	Mark Jenkins mark@thehardway.com
E39	2/10/2006	Linda Costello strega@adelphia.net
E42	2/12/2006	Jonathan Madsen JMadsen@uwyo.edu
E45	2/13/2006	David Ludlam - Fish For Life fishforlife8@hotmail.com 10 Attachments that follow from N.E.W. Electric, Inc. 1) Bud Alley 2) Ivan Martinez 3) Don Hockett 4) Spenser Rossi 5) Shawn Darlow 6) Brad Hubbard 7) Todd Wawrzyniak 8) Gilbert Medina 9) Curt Wendling 10) Mike Ulanski
E45A	2/13/2006	Bud Alley
E45B	2/13/2006	Ivan Martinez
E45E	2/13/2006	Don Hockett
E45E	2/13/2006	Shawn Darlow
E45F	2/13/2006	Brad Hubbard
E45G	2/13/2006	Todd Wawrzyniak
E45H	2/13/2006	Gilbert Medina
E45J	2/13/2006	Mike Ulanski

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Table N-1. Log of DEIS Letters with Substantive Comments cont.

Unique Identifying Number	Date Received	Agency, Organization, or Individual
Unique Emails File 6		
E51	2/13/2006	Amy Lowichik AmyLowichik@lycos.com
E66	2/13/2006	Chris Naumann jcnlmr@msn.com
E67	2/13/2006	Gloria McClain GMcinSJ@webtv.net
E70	2/14/2006	Candace Makowski holywonderland@yahoo.com
E84	2/16/2006	Norman F. Swanton - Chairman & CEO - Warren Resources, Inc. Wrnswanton@aol.com
E85	2/14/2006	Joan E. Binder - Wyoming State Geological Survey JEBinder@uwyo.edu
E86	2/14/2006	Pamela A. Lacey - Senior Managing Counsel for AGA - submitted by Susan Wegner swegner@aga.org
E88	2/15/2006	Barabara Dobos bdobos@bresnan.net
E91	2/16/2006	John Greer - Greer Services jgreer@GreerServices.com
E95	2/15/2006	Chuck Mollica chuckmollica@wyoming.com
E100	2/16/2006	Steve Liles sliles@warrenep.com
E102	2/16/2006	Mary Lou Morrison mamorrison@vcn.com
E105	2/17/2006	Bob Solomon bsolomon@tower-energy.com
E107	2/16/2006	Lloyd Davies lloyd Davies@earthlink.net
E108	2/17/2006	Mike Neumiller - North Fin LLC mikeneu@wyoming.com
E110	2/17/2006	Robert W. Schafer RobertS@hdgold.com
E112	2/17/2006	Arla Strasser - SERCD runkayak@aol.com
E114	2/17/2006	Linda Guthrie - Sr. Regulatory Specialist - Devon Energy Linda.Guthrie@dvn.com
E115	2/17/2006	Richard Currit RCURRI@state.wy.us
E117	2/17/2006	Ericka S. Cook - Petroleum Association of Wyoming Ericka@pawyo.org
E118	2/17/2006	Jason Blake - President - Titan Energy Resources jason@titanenergyresources.com
E121	2/17/2006	Harold Schultz harolds@wyoming.com
E122	2/17/2006	Ellis G. Vickers - Sr. Vice President - Land Management & Regulatory Affairs Warren Resources, Inc. submitted by Shawna Hamilton at sshwarren@qwest.net
E123	2/17/2006	Ken Gobble - Warren E&P, Inc. kgobble@warrenep.com
E124	2/17/2006	Little Snake River Conservation District lsrgcd@yahoo.com
E125	2/17/2006	Jeff Kessler jkessler@xmission.com
E126	2/17/2006	James Raney - Northern Regulatory Manager - Anadarko Petroleum Jim_Raney@anadarko.com
E127	2/17/2006	Claire M. Moseley - Executive Director - Public Lands Advocacy Clair@publiclandsadvocacy.org
E128A	2/17/2006	Sharon O'Toole (Patrick & Sharon O'Toole & George R. Salisbury, Jr.) - Submitted for Ladder Livestock Company LLC, Salisbury Livestock Co., Banjo Sheep Company LLC sharon@ladderranch.com
E128B	2/17/2006	Sharon O'Toole submitted for George R. Salisbury, Jr. of Salisbury Livestock Co.
E130	2/19/2006	Brett Pearson brettpearson05@msn.com
E132	2/21/2006	Dave Welch - National Preservation Officer - Oregon-California Trails Association welchd@comcast.net
E133	2/21/2006	Don Christianson DCHRIS@state.wy.us
E134	2/21/2006	Mike Bersch - The University of Alabama mgbersch@bama.ua.edu

Appendix N. Draft EIS Comment Letters

Table N-1. Log of DEIS Letters with Substantive Comments cont.

Unique Identifying Number	Date Received	Agency, Organization, or Individual
Unique Emails File 6		
E139	2/22/2006	Bill Lee blee@warrenep.com
E141	2/9/2006	David Stout - dstout9@bluemoon.net
Type A Form Email File 7		
TA1	2/7/2006	Sarah Schoenback - sschoenbach@nrdc.org
Type B Form Email File 8		
TB1	1/23/2006	gallo@ucar.edu

Appendix O

BLM Responses to Comments

**A full version of appendix O can be found on
the enclosed CD at the back of this volume.**

APPENDIX O

BLM RESPONSES TO COMMENTS

Appendix O provides BLM responses to substantive comments on the Atlantic Rim Draft EIS. To locate specific comments and responses, please use the process for locating letter and unique email identification numbers provided in appendix N. Complete comments and context can be viewed in the original letters (appendix N) which have been annotated to identify specific comments and assertions. Letters and emails that did not include an individual substantive comment are not included in appendix O, and are available at the BLM Rawlins Field Office.

The procedure for locating a specific comment and response in appendix O is as follows:

1. The log of substantive letters is included as table O-1.
2. After locating the appropriate letter number, follow the instructions in appendix N to locate the corresponding comment numbers and assertion numbers (if applicable).
 - a. Letter # - Comment # - Assertion # (if applicable)
3. Then search table O-2, BLM Responses to Comments which can be found on the compact disc (CD) enclosed in appendix N for the specific letter # - comment # and assertion # (if applicable). Table O-2 is organized chronologically by letter number.

Comment responses in appendix O are presented using the following format:

Comment Number Letter (or Unique Email) # - Comment # - Assertion #

Comment

The specific comment or assertion requiring a response is included in this field. The complete comment and context can be viewed in appendix N.

Response

BLM's response to the specific comment or assertion appears in this field.

Appendix O. BLM Responses to Comments

Table O-1. Log of DEIS Letters with Substantive Comments

Unique Identifying Number	Date Received	Agency, Organization, or Individual
Hard Copy File 1		
250	01/25/2006	Jason A. Lillegraven (letter)
384	01/30/2006	Brian T. Kelly, U.S. Fish and Wildlife Service (letter)
388	02/08/2006	Ray and Kathleen Weber, Weber Ranch Company (letter)
393	02/09/2006	Douglas Arcand (fax)
396	02/09/2006	Loni McKinney (fax)
397	02/09/2006	Harley McKinney (fax)
399	02/09/2006	Jason Dolce (fax)
407	02/09/2006	Corky Faler (fax)
413	02/10/2006	Bill Wichers, Wyoming Game and Fish Department (letter)
416	02/13/2006	Mike Vandenberg (letter)
420	02/13/2006	Alan Hayes (letter)
424	02/13/2006	Brittany Shaklee (letter)
428	02/13/2006	Angela Pacheco (letter)
456	02/14/2006	John Gillaspy (fax)
460	02/14/2006	Lloyd Denton (fax)
466	02/15/2006	John V. Corra, State of Wyoming, Department of Environmental Quality (letter)
470	02/15/2006	Ken Funk (letter)
471	02/15/2006	Art Zeiger, Commissioners of Carbon County (letter)
472	02/15/2006	John A. MacPherson (letter)
476	02/16/2006	Ron Hedlund (letter)
482	02/16/2006	Shaun Foster (letter)
483	02/16/2006	Robin P. Diedrich, Nance Petroleum Corporation (letter)
490	02/16/2006	John Zampedri (fax)
508	02/16/2006	Hollie Butler (letter)
521	02/16/2006	Joyce Allen (letter)
545	02/16/2006	Linda Winner (letter)
547	02/16/2006	Pete A [last name undecipherable] (letter)
548	02/16/2006	[name undecipherable] (letter)
557	02/16/2006	Marie [last name undecipherable] (letter)
581	02/16/2006	Barbara Parsons (letter)
588	02/17/2006	J.B. Anderson (fax)
590	02/17/2006	Bonnie Egbert (fax)
593	02/17/2006	Debbie Rubeck (fax)
598	02/17/2006	Kole Egbert (fax)
603	02/17/2006	Tiffaney Egbert (fax)
605	02/17/2006	Leigh Nation (fax)
606	02/17/2006	D. Steven Degenfelder, Double Eagle Petroleum Company (letter)
Hard Copy File 2		
607	02/17/2006	Tom Clayson, Anadarko Petroleum Corporation (letter)
Hard Copy File 3		
619	02/17/2006	Kathy Staman (letter)
620	02/17/2006	Rowe Anderson (letter)

Appendix O. BLM Responses to Comments

Table O-1. Log of DEIS Letters with Substantive Comments

Unique Identifying Number	Date Received	Agency, Organization, or Individual
632	02/17/2006	John P. Lockridge, Mountain Energy, LLC
636	02/17/2006	Laurie Milford and Jeff Rickerl (letter)
642	02/17/2006	Jay Linderman (letter)
647	02/17/2006	Laura Lindley, Bjork, Lindley, Little PC, for Redwine Resources, Inc. (letter)
648	02/21/2006	Shane Spear, Sun-West Oil and Gas, Inc. (letter)
652	02/21/2006	Lane Lasrich (letter)
653	02/21/2006	Michel E. Curry (letter)
664	02/21/2006	Jodee G. Pring, State of Wyoming, State Engineer's Office (letter)
665	02/21/2006	Larry Svoboda, U.S. Environmental Protection Agency (letter)
666	02/21/2006	A. William Alldredge, Ph.D. (letter)
Hard Copy File 4		
671	02/21/2006	Erik Molvar, Biodiversity Conservation Alliance (letter)
Hard Copy File 5		
673	02/22/2006	Mark S. Dolar, Dolar Energy, LLC (letter)
674	02/23/2006	Lynn Boomgaarden, State of Wyoming, Office of State Lands and Investments (letter)
675	02/23/2006	John D. Adamson (letter)
678	02/28/2006	John Etchepare, State of Wyoming, Wyoming Department of Agriculture (letter)
681	02/22/2006	Dave Freudenthal, State of Wyoming, Office of the Governor (letter)
682	02/22/2006	Michael A. Saul, National Wildlife Federation (letter)
683	03/02/2006	Jaralyn Beek, Bureau of Reclamation (letter)
684	04/20/2006	D. Steven Degenfelder, Double Eagle Petroleum Company (letter)
Unique Emails File 6		
E3	01/23/2006	Andrew Blair andy_blair@faculty.nols.edu
E4	01/23/2006	Donald Duerr djduerr@hotmail.com
E6	01/28/2006	Jane Robinett jane_robinett@bresnan.net
E7	01/28/2006	Danny Dale ddale@uwyo.edu
E11	02/02/2006	Jeffrey A. Lockwood - Professor of Natural Sciences & Humanities - University of Wyoming Lockwood@uwyo.edu
E13	02/02/2006	Martha Christensen martchris@charter.net
E33	02/09/2006	Gordon James gtjames1940@yahoo.com
E38	02/10/2006	Mark Jenkins mark@thehardway.com
E39	02/10/2006	Linda Costello strega@adelphia.net
E42	02/12/2006	Jonathan Madsen JMadsen@uwyo.edu
E45	02/13/2006	David Ludlam - Fish For Life fishforlife8@hotmail.com 10 Attachments that follow from N.E.W. Electric, Inc. 1) Bud Alley 2) Ivan Martinez 3) Don Hockett 4) Spenser Rossi 5) Shawn Darlow 6) Brad Hubbard 7) Todd Wawrzyniak 8) Gilbert Medina 9) Curt Wendling 10) Mike Ulanski
E45A	02/13/2006	Bud Alley
E45B	02/13/2006	Ivan Martinez
E45C	02/13/2006	Don Hockett
E45E	02/13/2006	Shawn Darlow
E45F	02/13/2006	Brad Hubbard

Appendix O. BLM Responses to Comments

Table O-1. Log of DEIS Letters with Substantive Comments

Unique Identifying Number	Date Received	Agency, Organization, or Individual
E45G	02/13/2006	Todd Wawrzyniak
E45H	02/13/2006	Gilbert Medina
E45J	02/13/2006	Mike Ulanski
E51	02/13/2006	Amy Lowichik AmyLowichik@lycos.com
E66	02/13/2006	Chris Naumann jcnlmr@msn.com
E67	02/13/2006	Gloria McClain GMcinSJ@webtv.net
E70	02/14/2006	Candace Makowski holywonderland@yahoo.com
E84	02/16/2006	Norman F. Swanton - Chairman & CEO - Warren Resources, Inc. Wrnswanton@aol.com
E85	02/14/2006	Joan E. Binder - Wyoming State Geological Survey JEBinder@uwyo.edu
E86	02/14/2006	Pamela A. Lacey - Senior Managing Counsel for AGA - submitted by Susan Wegner swegner@aga.org
E88	02/15/2006	Barabara Dobos bdobos@bresnan.net
E91	02/16/2006	John Greer - Greer Services jgreer@GreerServices.com
E95	02/15/2006	Chuck Mollica chuckmollica@wyoming.com
E100	02/16/2006	Steve Liles sliles@warrenep.com
E102	02/16/2006	Mary Lou Morrison mamorrison@vcn.com
E105	02/17/2006	Bob Solomon bsolomon@tower-energy.com
E107	02/16/2006	Lloyd Davies lloydavies@earthlink.net
E108	02/17/2006	Mike Neumiller - North Fin LLC mikeneu@wyoming.com
E110	02/17/2006	Robert W. Schafer RobertS@hdgold.com
E112	02/17/2006	Arla Strasser - SERCD runkayak@aol.com
E114	02/17/2006	Linda Guthrie - Sr. Regulatory Specialist - Devon Energy Linda.Guthrie@dvn.com
E115	02/17/2006	Richard Currit RCURRI@state.wy.us
E117	02/17/2006	Ericka S. Cook - Petroleum Association of Wyoming Ericka@pawyo.org
E118	02/17/2006	Jason Blake - President - Titan Energy Resources jason@titanenergyresources.com
E121	02/17/2006	Harold Schultz harolds@wyoming.com
E122	02/17/2006	Ellis G. Vickers - Sr. Vice President - Land Management & Regulatory Affairs Warren Resources, Inc. submitted by Shawna Hamilton at sshwarren@qwest.net
E123	02/17/2006	Ken Gobble - Warren E&P, Inc. kgobble@warrenep.com
E124	02/17/2006	Little Snake River Conservation District lsrcd@yahoo.com
E125	02/17/2006	Jeff Kessler jkessler@xmission.com
E126	02/17/2006	James Raney - Northern Regulatory Manager - Anadarko Petroleum Jim_Raney@anadarko.com
E127	02/17/2006	Claire M. Moseley - Executive Director - Public Lands Advocacy Clair@publiclandsadvocacy.org
E128A	02/17/2006	Sharon O'Toole (Patrick & Sharon O'Toole & George R. Salisbury, Jr.) - Submitted for Ladder Livestock Company LLC, Salisbury Livestock Co., Banjo Sheep Company LLC sharon@ladderranch.com
E128B	02/17/2006	Sharon O'Toole submitted for George R. Salisbury, Jr. of Salisbury Livestock Co.
E130	02/19/2006	Brett Pearson brettpearson05@msn.com

Appendix O. BLM Responses to Comments

Table O-1. Log of DEIS Letters with Substantive Comments

Unique Identifying Number	Date Received	Agency, Organization, or Individual
E132	02/21/2006	Dave Welch - National Preservation Officer - Oregon-California Trails Association welchd@comcast.net
E133	02/21/2006	Don Christianson DCHRIS@state.wy.us
E134	02/21/2006	Mike Bersch - The University of Alabama mgbersch@bama.ua.edu
E139	02/22/2006	Bill Lee blee@warrenep.com
E141	02/09/2006	David Stout - dstout9@bluemoon.net
Type A Form Email File 7		
TA1	02/07/2006	Sarah Schoenback - sschoenbach@nrdc.org
Type B Form Email File 8		
TB1	01/23/2006	gallo@ucar.edu

